About This Guide

This preface discusses the objectives, audience, organization, and conventions of this hardware installation guide. This preface also provides general information about Cisco documentation. Sections in this preface are:

- Objectives on page vii
- How to Use This Guide on page viii
- Audience on page viii
- Organization on page ix
- Conventions on page ix
- Obtaining Service and Support on page xii
- Cisco Connection Online on page xii
- Ordering Documentation on page xiv

Objectives

This publication provides hardware installation information for Cisco WAN and voice interface cards used in Cisco 3600 series, 2600 series, 1600 series, and Cisco 1720 modular routers (herein referred to as Cisco modular routers).

This publication also provides minimum software configuration information for configuring WAN interface cards, but this is not meant as comprehensive router configuration instructions. For detailed software configuration information, refer to the Cisco IOS configuration guide and command reference publications. These publications are available on the Documentation CD-ROM that came with your router or you can order printed copies. (See the “Ordering Documentation” section on page xiv.)

Note This publication describes a variety of router models that are similar in functionality, but differ in the number of interfaces supported. Some information provided might not apply to your particular router model.

How to Use This Guide

- Use Table 1-1 in Chapter 1, “Overview of Cisco WAN and Voice Interface Cards” to identify the WAN and voice interface cards compatible with Cisco 3600 series routers and their required release of Cisco IOS software.
- Use Table 1-2 in Chapter 1, “Overview of Cisco WAN and Voice Interface Cards” to identify the WAN and voice interface cards compatible with Cisco 2600 series routers and their required release of Cisco IOS software.
- Use Table 1-3 in Chapter 1, “Overview of Cisco WAN and Voice Interface Cards” to identify the WAN interface cards compatible with the Cisco 1720 router and their required release of Cisco IOS software.
- Use Table 1-4 in Chapter 1, “Overview of Cisco WAN and Voice Interface Cards” to identify the WAN interface cards compatible with Cisco 1600 series routers and their required release of Cisco IOS software.
- See Chapter 2, “Installing WAN and Voice Interface Cards in a Cisco Modular Router” for instructions to install the WAN or voice interface card in a network module or in a chassis card slot.
- See Chapter 3, “Connecting WAN and Voice Interface Cards to a Network” for instructions to connect the WAN or voice interface card to the network.

Audience

This publication is designed for the person installing the router, who should be familiar with electronic circuitry and wiring practices and have experience as an electronic or electromechanical technician.

Organization

The major sections of this guide are as follows:

Chapter	Title	Description
Chapter 1	Overview of Cisco WAN and Voice Interface Cards	Lists the WAN and voice interface card options for Cisco modular routers, discusses environmental requirements and safety recommendations, and describes how to prepare for connections between networks and ports.
Chapter 2	Installing WAN and Voice Interface Cards in a Cisco Modular Router	Includes basic installation information for installing network modules in Cisco 3600 series and Cisco 2600 series routers, and for installing interface cards directly into chassis slots on Cisco 2600 series, Cisco 1600 series, and Cisco 1720 modular routers.
Chapter 3	Connecting WAN and Voice Interface Cards to a Network	Provides basic hardware installation information for connecting WAN and voice interface cards to a network, and reading interface cards LEDs.

Conventions

This publication uses the following conventions to convey instructions and information:

Convention	Description
boldface font	Commands and keywords.
italic font	Variables for which you supply values.
[ ]	Keywords or arguments that appear within square brackets are optional.
{x | y | z}	A choice of required keywords appears in braces separated by vertical bars. You must select one.

Conventions

Convention	Description
`screen font`	Examples of information displayed on the screen.
`boldface screen font`	Examples of information you must enter.
< >	Nonprinting characters, for example passwords, appear in angle brackets.
[ ]	Default responses to system prompts appear in square brackets.
Note	Means *reader take note*. Notes contain helpful suggestions or references to additional information and material.
	Timesaver This symbol means *the described action saves time*. You can save time by performing the action described in the paragraph.
	Caution This symbol means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.
	Warning This warning symbol means *danger.* You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device. **Waarschuwing** Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen. Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het document *Regulatory Compliance and Safety Information* (Informatie over naleving van veiligheids- en andere voorschriften) raadplegen dat bij dit toestel is ingesloten. **Varoitus** Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. Tässä julkaisussa esiintyvien varoitusten käännökset löydät laitteen mukana olevasta *Regulatory Compliance and Safety Information* -kirjasesta (määräysten noudattaminen ja tietoa turvallisuudesta).

Convention	Description
	Attention Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions d'avertissements figurant dans cette publication, consultez le document *Regulatory Compliance and Safety Information* (Conformité aux règlements et consignes de sécurité) qui accompagne cet appareil. **Warnung** Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Dokument *Regulatory Compliance and Safety Information* (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde. **Avvertenza** Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento *Regulatory Compliance and Safety Information* (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo. **Advarsel** Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du vare oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet *Regulatory Compliance and Safety Information* (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten. **Aviso** Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. Para ver as traduções dos avisos que constam desta publicação, consulte o documento *Regulatory Compliance and Safety Information* (Informação de Segurança e Disposições Reguladoras) que acompanha este dispositivo.

Convention	Description
	¡Advertencia! Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. Para ver una traducción de las advertencias que aparecen en esta publicación, consultar el documento titulado *Regulatory Compliance and Safety Information* (Información sobre seguridad y conformidad con las disposiciones reglamentarias) que se acompaña con este dispositivo. **Varning!** Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. Se förklaringar av de varningar som förkommer i denna publikation i dokumentet *Regulatory Compliance and Safety Information* (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.

Obtaining Service and Support

For service and support for a router purchased from a reseller, contact the reseller. Resellers offer a wide variety of Cisco service and support programs, which are described in the *Cisco Information Packet* that shipped with your router.

Note If you purchased your router from a reseller, you can also access Cisco Connection Online (CCO) as a guest. CCO is Cisco Systems' primary, real-time support channel. Your reseller offers programs that include direct access to CCO's services.

For service and support for a router purchased directly from Cisco, use CCO.

Cisco Connection Online

Cisco Connection Online (CCO) is Cisco Systems' primary, real-time support channel. Maintenance customers and partners can self-register on CCO to obtain additional information and services.

Available 24 hours a day, 7 days a week, CCO provides a wealth of standard and value-added services to Cisco's customers and business partners. CCO services include product information, product documentation, software updates, release notes, technical tips, the Bug Navigator, configuration notes, brochures, descriptions of service offerings, and download access to public and authorized files.

CCO serves a wide variety of users through two interfaces that are updated and enhanced simultaneously: a character-based version and a multimedia version that resides on the World Wide Web (WWW). The character-based CCO supports Zmodem, Kermit, Xmodem, FTP, and Internet e-mail, and it is excellent for quick access to information over lower bandwidths. The WWW version of CCO provides richly formatted documents with photographs, figures, graphics, and video, as well as hyperlinks to related information.

You can access CCO in the following ways:

- WWW: http://www.cisco.com
- WWW: http://www-europe.cisco.com
- WWW: http://www-china.cisco.com
- Telnet: cco.cisco.com
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

Note If you are a network administrator and need personal technical assistance with a Cisco product that is under warranty or covered by a maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or tac@cisco.com. To obtain general information about Cisco Systems, Cisco products, or upgrades, contact 800 553-6387, 408 526-7208, or cs-rep@cisco.com.

Please use CCO to obtain general information about Cisco Systems, Cisco products, or upgrades. If CCO is not accessible, contact 800 553-6387, 408 526-7208, or cs-rep@cisco.com.

Ordering Documentation

Cisco documentation and additional literature are available in a CD-ROM package, which ships with your product. The Documentation CD-ROM, a member of the Cisco Connection Family, is updated monthly. Therefore, it might be more current than printed documentation. To order additional copies of the Documentation CD-ROM, contact your local sales representative or call customer service. The CD-ROM package is available as a single package or as an annual subscription. You can also access Cisco documentation on the World Wide Web at http://www.cisco.com, http://www-china.cisco.com, or http://www-europe.cisco.com.

If you are reading Cisco product documentation on the World Wide Web, you can submit comments electronically. Click **Feedback** in the toolbar and select **Documentation**. After you complete the form, click **Submit** to send it to Cisco. We appreciate your comments.

CHAPTER 1

Overview of Cisco WAN and Voice Interface Cards

This chapter provides an overview of Cisco WAN and voice interface cards used in Cisco modular routers, and includes these sections:

- Cisco 3600 Series Routers on page 1-1
- Cisco 2600 Series Routers on page 1-7
- Cisco 1720 Router on page 1-12
- Cisco 1600 Series Routers on page 1-13
- Safety and Regulatory Compliance Information on page 1-16

Cisco 3600 Series Routers

The Cisco 3600 series is a multifunction, modular platform that combines dial access, routing, LAN-to-LAN services, and multiservice integration of voice, video, and data in the same device. The Cisco 3600 series includes the Cisco 3640 (see Figure 1-1) and Cisco 3620 routers (see Figure 1-2).

The Cisco 3640 has four network module slots; the Cisco 3620 has two slots. Each network module slot accepts a variety of network module interface cards, supporting a variety of LAN and WAN technologies.

Figure 1-1 Cisco 3640 Router Rear View

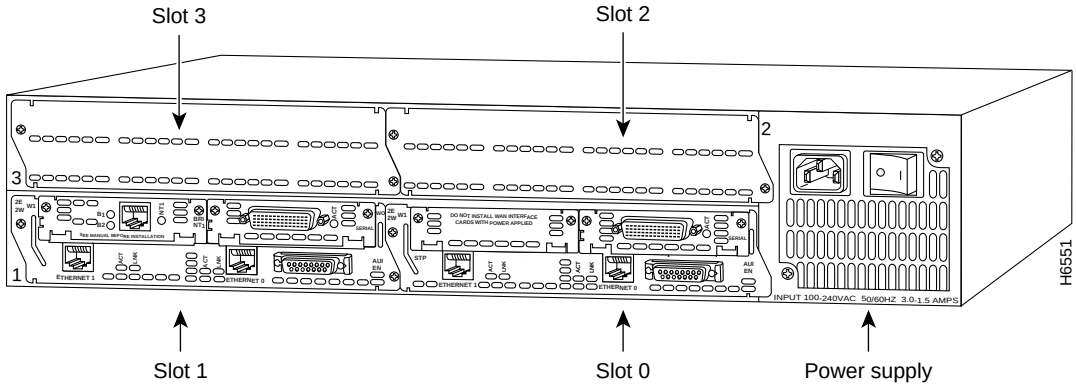
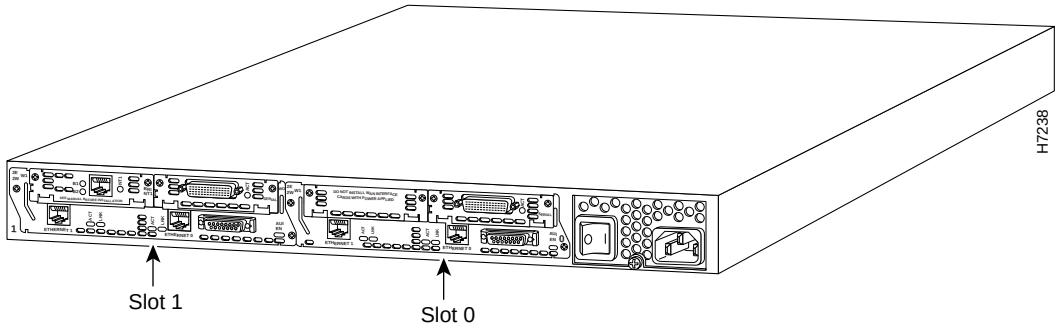


Figure 1-2 Cisco 3620 Router Rear View



Cisco 3600 Series Interface Numbering

Each individual network interface on a Cisco 3600 series router is identified by a slot number and a unit number.

Slot Numbering

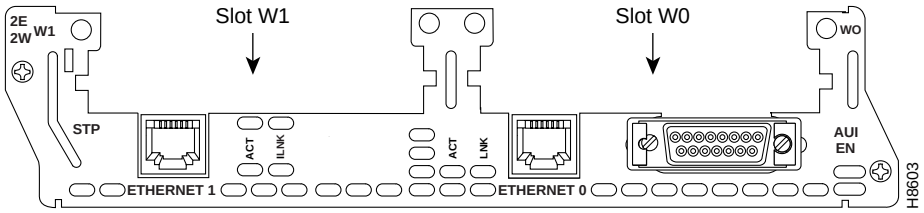
The Cisco 3600 series router chassis contains two or four slots in which you can install modules. You can install any module into any available slot in the chassis.

As shown in Figure 1-1 and Figure 1-2, the slots are numbered as follows:

- Slot 0 is at the bottom right (as viewed from the rear of the chassis), near the power supply.
- Slot 1 is at the bottom left.
- Slot 2 is at the top right, above slot 0.
- Slot 3 is at the top left, above slot 1.

Some modules have two small slots, labeled W0 and W1, for WAN interface cards. Figure 1-3 shows the W0 and W1 slots of the 2 Ethernet 2 WAN card slot (2E 2-slot) module. You can install WAN interface cards into the small module slots (W0 and W1). Serial WAN interface cards can be installed into either slot, W0 or W1.

Figure 1-3 WAN Interface Card Slots



Unit Numbering

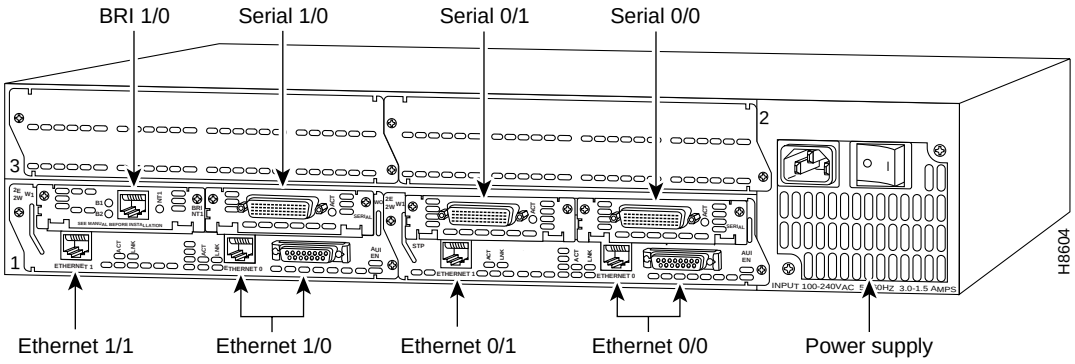
Cisco 3600 series routers unit numbers identify the interfaces on the modules and WAN interface cards installed in the router. Unit numbers begin at 0 for each interface type, and continue from right to left and (if necessary) from bottom to top. Modules and WAN interface cards are identified by interface type, slot number, followed by a forward slash (/), and then the unit number; for example, Ethernet 0/0.

Figure 1-4 shows a router with a 2E 2-slot module in slots 0 and 1. Two serial WAN interface cards are installed in the module in slot 0. One serial and one ISDN BRI WAN interface card are installed in the module in slot 1.

As shown in Figure 1-4, the unit numbers are as follows:

- Slot 0, Ethernet interface 0, referred to as Ethernet 0/0
- Slot 0, Ethernet interface 1, referred to as Ethernet 0/1
- Slot 0, serial interface 0, referred to as serial 0/0
- Slot 0, serial interface 1, referred to as serial 0/1
- Slot 1, Ethernet interface 0, referred to as Ethernet 1/0
- Slot 1, Ethernet interface 1, referred to as Ethernet 1/1
- Slot 1, serial interface 0, referred to as serial 1/0
- Slot 1, BRI interface 0, referred to as BRI 1/0

Figure 1-4 Cisco 3600 Series Unit Numbers



Voice Interface Numbering in Cisco 3600 Series Routers

Voice interfaces are numbered differently from WAN interfaces described in the previous section, “Unit Numbering.” Voice interfaces are numbered as follows:

interface type chassis slot/voice module slot/voice interface

If you have a four-channel voice network module installed in slot 1 of your router, the voice interfaces will be:

- Slot 1, voice network module slot 0, voice interface 0, referred to as voice 1/0/0 (closest to chassis slot 0)
- Slot 1, voice network module slot 0, voice interface 1, referred to as voice 1/0/1
- Slot 1, voice network module slot 1, voice interface 0, referred to as voice 1/1/0
- Slot 1, voice network module slot 1, voice interface 1, referred to as voice 1/1/1 (farthest from chassis slot 0)

WAN and Voice Interface Card Options for Cisco 3600 Series Routers

Table 1-1 lists the WAN and voice interface card options available for Cisco 3600 series routers with their minimum software requirements for supported Cisco IOS releases.

Note Voice interface cards can only be used in voice network modules (NM-1V and NM-2V).

Table 1-1 WAN and Voice Interface Card Options with Cisco IOS Releases for Cisco 3600 Series Routers

WAN Interface Card	Cisco IOS Release 11.1	Cisco IOS Release 11.2	Cisco IOS Release 11.3	Cisco IOS Release 11.3T	Cisco IOS Release 12.0	Cisco IOS Release 12.0T
1-Port Serial (WIC-1T)	11.1(7)AA	11.2(5)P	11.3(1)	11.3(3)T	12.0(1)	12.0(1)T
1-Port ISDN BRI S/T[1] with NT1 (WIC-1B-S/T)	–	11.2(4)XA 11.2(5)P	11.3(1)	11.3(3)T	12.0(1)	12.0(1)T
1-Port ISDN BRI U[2] (WIC-1B-U)	–	11.2(4)XA 11/2(5)P	11.3(1)	11.3(3)T	12.0(1)	12.0(1)T
1-Port ISDN BRI S/T[3] Leased Line (WIC-1B-S/T-LL)	11.1(7)AA	11.2(9)P	–	11.3(3)T	–	12.0(1)T
1-Port 56/64-kbps CSU/DSU (WIC 1DSU-56K4)	–	11.2(12)P	–	11.3(3)T	–	12.0(1)T
1-Port T1 (WIC-1DSU-T1)	–	11.2(12)P	–	11.3(3)T	–	12.0(1)T
2-Port FXS voice/fax interface (VIC-2FXS)	–	–	–	11.3(1)T	12.0(1)	12.0(1)T
2-Port FXO voice/fax interface (VIC-2FXO)	–	–	–	11.3(1)T	12.0(1)	12.0(1)T
2-Port E&M voice/fax interface (VIC-2E/M)	–	–	–	11.3(1)T	12.0(1)	12.0(1)T
2-Port FXO voice/fax interface for use in Europe (VIC-2FXO-EU)	–	–	–	11.3(6)T	–	12.0(1)T
2-Port E&M voice/fax interface for use in Australia (VIC-2FXO-M3)	–	–	–	11.3(6)T	–	12.0(1)T

Table 1-1 WAN and Voice Interface Card Options with Cisco IOS Releases for Cisco 3600 Series Routers (continued)

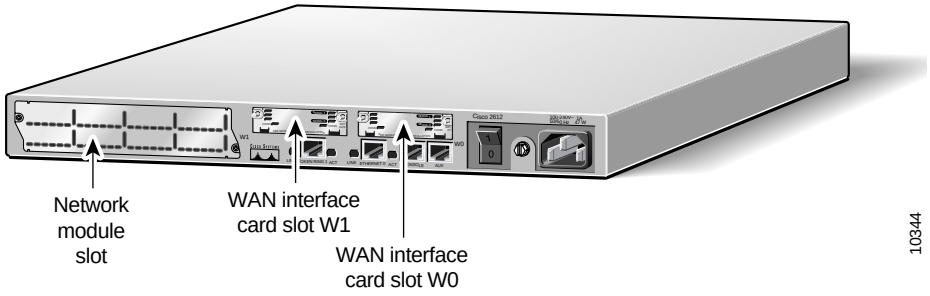
WAN Interface Card	Cisco IOS Release 11.1	Cisco IOS Release 11.2	Cisco IOS Release 11.3	Cisco IOS Release 11.3T	Cisco IOS Release 12.0	Cisco IOS Release 12.0T
2-Port ISDN BRI voice interface (VIC-2BRI-S/T-TE)	–	–	–	–	12.0(2)XD	–

1 Some ISDN service providers require an external Network Termination 1 (NT1) device to connect an ISDN S/T port to the ISDN line. If your service provider requires this, you must provide the NT1.
2 The BRI U module does not require an external NT1.
3 Some ISDN service providers require an external Network Termination 1 (NT1) device to connect an ISDN S/T port to the ISDN line. If your service provider requires this, you must provide the NT1.

Cisco 2600 Series Routers

The Cisco 2600 series is a multifunction platform that combines dial access, routing, LAN-to-LAN services, and multiservice integration of voice, video, and data in the same device. The Cisco 2600 series provides a low-entry price for medium-sized businesses. The Cisco 2600 series has built-in LAN connections that provides a single or dual Ethernet port (depending on model), one Ethernet, and one token ring port. Cisco 2600 series routers also include one network module slot and two WAN slots that accept a variety of network modules and interface cards. Figure 1-5 illustrates a Cisco 2611 router showing the network module slot and WAN interface card slots.

Figure 1-5 Cisco 2600 Series Rear View



Cisco 2600 Series Interface Numbering

Each individual network interface on a Cisco 2600 series router is identified by a slot number and a unit number.

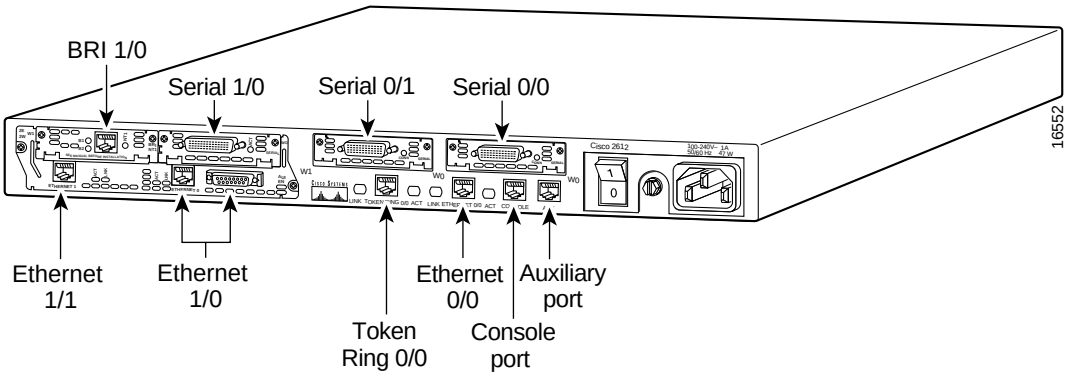
Slot and Unit Numbering

The Cisco 2600 series router chassis contains one slot in which you can install a network module. This is always slot 1.

Unit numbers identify the interfaces on the modules and WAN interface cards installed in the router. Unit numbers begin at 0 for each interface type, and continue from right to left and (if necessary) from bottom to top. Modules and WAN interface cards are identified by interface type, slot number, followed by a forward slash (/), and then the unit number; for example, Ethernet 0/0.

Figure 1-6 shows a router with a 2E 2-slot module in slot 1. One serial and one ISDN BRI WAN interface card are installed in the module.

Figure 1-6 Cisco 2600 Series Unit Numbers



Note WAN interface card slots (built into the chassis) are always numbered as slot 0, even if the interface card is installed in the slot labeled W1.

Figure 1-6 shows the following unit numbers:

- First Ethernet interface, referred to as Ethernet 0/0
- Token Ring interface, referred to as Token Ring 0/0
- Slot W0, serial interface 0, referred to as serial 0/0
- Slot W1, serial interface 1, referred to as serial 0/1
- Slot 1, Ethernet interface 0, referred to as Ethernet 1/0
- Slot 1, Ethernet interface 1, referred to as Ethernet 1/1
- Slot 1, serial interface 0, referred to as serial 1/0
- Slot 1, BRI interface 0, referred to BRI 1/0

Voice Interface Numbering in Cisco 2600 Series Routers

Voice interfaces are numbered differently from WAN interfaces described in the previous section, “Slot and Unit Numbering.” Voice interfaces are numbered as follows:

interface type chassis slot/voice module slot/voice interface

If you have a four-channel voice network module installed in slot 1 of your router, the voice interfaces will be:

- Slot 1, voice network module slot 0, voice interface 0, referred to as voice 1/0/0 (closest to the chassis WAN interface card slots)
- Slot 1, voice network module slot 0, voice interface 1, referred to as voice 1/0/1
- Slot 1, voice network module slot 1, voice interface 0, referred to as voice 1/1/0
- Slot 1, voice network module slot 1, voice interface 1, referred to as voice 1/1/1 (farthest from the chassis WAN interface card slots)

WAN and Voice Interface Card Options for Cisco 2600 Series Routers

Table 1-2 lists the WAN and voice interface card options available for Cisco 2600 series routers with their minimum software requirements for supported Cisco IOS releases.

Note Voice interface cards can only be used in voice network modules (NM-1V and NM-2V).

Table 1-2 WAN and Voice Interface Card Options with Cisco IOS Releases for Cisco 2600 Series Routers

WAN Interface Card	Cisco IOS Release 11.3	Cisco IOS Release 11.3T	Cisco IOS Release 12.0	Cisco IOS Release 12.0T
1-Port Serial (WIC-1T)	11.3(2)XA	11.3(4)T	12.0(1)	12.0(1)T
2-Port Serial (WIC-2T)	11.3(2)XA	11.3(4)T	12.0(1)	12.0(1)T
2-Port Asynchronous/Synchronous Serial (WIC-2A/S)	11.3(2)XA	11.3(4)T	12.0(1)	12.0(1)T
1-Port ISDN BRI S/T[1] (WIC-1B-S/T)	11.3(2)XA	11.3(4)T	12.0(1)	12.0(1)T
1-Port ISDN BRI U[2] (WIC-1B-U)	11.3(2)XA	11.3(4)T	12.0(1)	12.0(1)T
1-Port 56/64-kbps CSU/DSU (WIC-1DSU-56K4)	11.3(2)XAT	11.3(4)T	–	12.0(1)T
1-Port T1/FT1 (WIC-1DSU-T1)	–	11.3(4)T	–	12.0(1)T
2-Port FXS voice/fax interface (VIC-2FXS)	–	11.3(1)T	12.0(1)	12.0(1)T
2-Port FXO voice/fax interface (VIC-2FXO)	–	11.3(1)T	12.0(1)	12.0(1)T
2-Port E&M voice/fax interface (VIC-2E/M)	–	11.3(1)T	12.0(1)	12.0(1)T
2-Port FXO voice/fax interface for use in Europe (VIC-2FXO-EU)	–	11.3(6)T	–	12.0(1)T
2-Port E&M voice/fax interface for use in Australia (VIC-2FXO-M3)	–	11.3(6)T	–	12.0(1)T
2-Port ISDN BRI voice interface (VIC-2BRI-S/T-TE)	–	–	12.0(2)XD	–

1 Some ISDN service providers require an external Network Termination 1 (NT1) device to connect an ISDN S/T port to the ISDN line. If your service provider requires this, you must provide the NT1.

2 The BRI U module does not require an external NT1.

Cisco 1720 Router

The Cisco 1720 router is a small, modular desktop router that links small- to medium-size remote Ethernet and Fast Ethernet LANs over one to four WAN connections to regional and central offices. (See Figure 1-7.)

The Cisco 1720 router includes one Fast Ethernet port and two WAN interface card slots.

Figure 1-7 Cisco 1720 Router Rear View

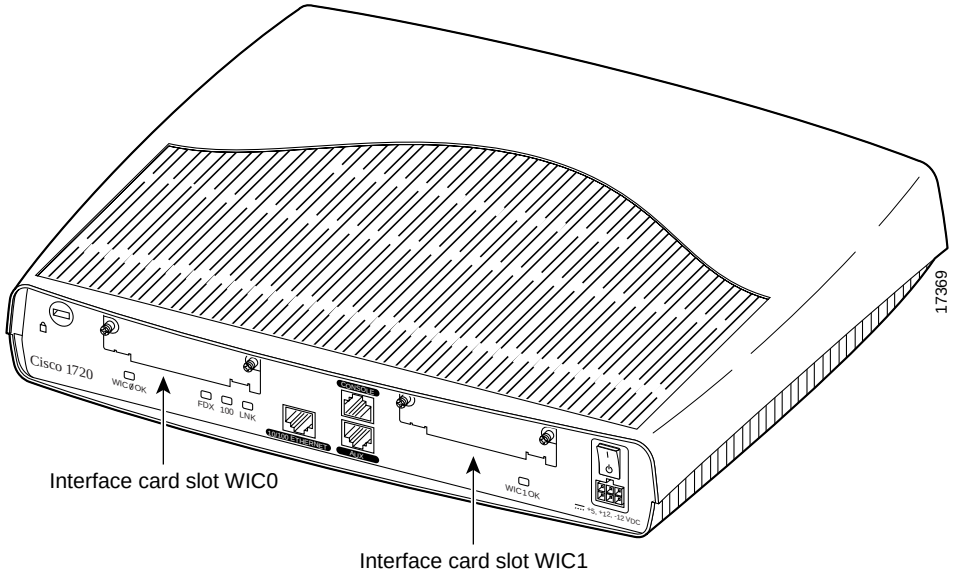


Table 1-3 lists WAN interface card options available for the Cisco 1720 router with their minimum software requirements for Cisco IOS Release 12.0.

Table 1-3 WAN Interface Card Options with Cisco IOS Releases for the Cisco 1720 Router

WAN Interface Card	Cisco IOS Release
1-Port Serial (WIC-1T)	12.0(1)XA3
2-Port Serial (WIC-2T)	12.0(1)XA3
2-Port Asynchronous/Synchronous Serial (WIC-2A/S)	12.0(1)XA3
1-Port ISDN BRI S/T (WIC-1B-S/T)	12.0(1)XA3
1-Port ISDN BRI U (WIC-1B-U)	12.0(1)XA3
1-Port 56/64-kbps CSU/DSU (WIC-1DSU-56K4)	12.0(1)XA3
1-Port T1/FT1 (WIC-1DSU-T1)	12.0(1)XA3

Cisco 1600 Series Routers

The Cisco 1600 series of access routers connect small offices with Ethernet LANs to the public Internet and to a company's internal intranet or corporate LAN through several WAN connections. The Cisco 1600 series routers include the following models: the Cisco 1601, Cisco 1602, Cisco 1603, Cisco 1604, and Cisco 1605-R. (See Figure 1-8 through Figure 1-12.)

All Cisco 1600 series models include one Ethernet port, one built-in WAN port, and one WAN interface card expansion slot for additional connectivity and flexibility.

Figure 1-8 Cisco 1601 Rear View

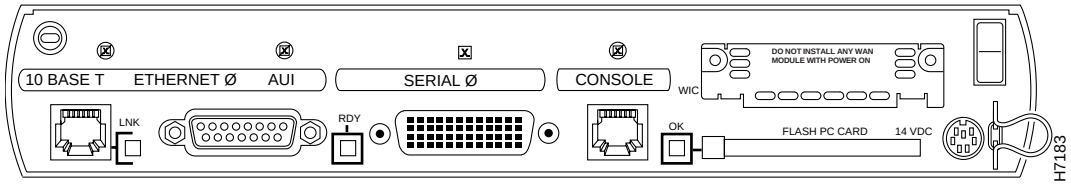


Figure 1-9 Cisco 1602 Rear View

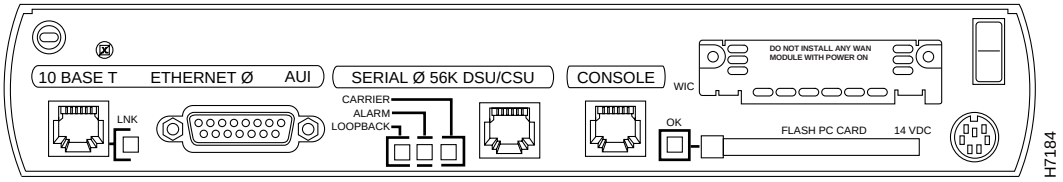


Figure 1-10 Cisco 1603 Rear View

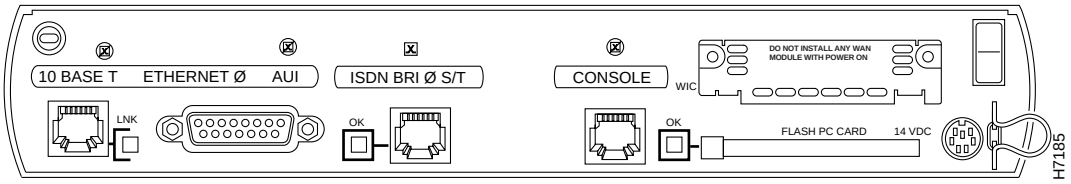


Figure 1-11 Cisco 1604 Rear View

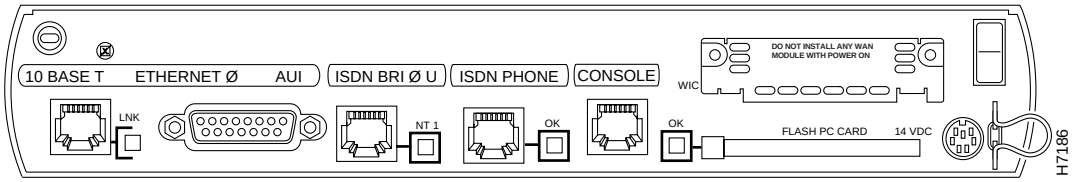


Figure 1-12 Cisco 1605-R Rear View

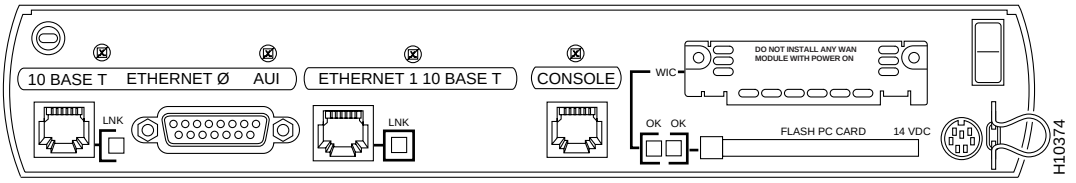


Table 1-4 lists the WAN interface card options available for Cisco 1600 series routers with their minimum software requirements for supported Cisco IOS releases.

Table 1-4 WAN Interface Card Options with Cisco IOS Releases for Cisco 1600 Series Routers

WAN Interface Card	Cisco IOS Release 11.1	Cisco IOS Release 11.2	Cisco IOS Release 11.3	Cisco IOS Release 11.3T
1-Port Serial (WIC-1T)	11.1(7)AA	11.2(5)P	11.3(1)	11.3(3)T
1-Port ISDN BRI U[1] (WIC-1B-U)	11.1(7)AA	11.2(5)P	11.3(1)	11.3(3)T
1-Port ISDN BRI S/T[2] (WIC-1B-S/T)	11.1(7)AA	11.2(5)P	11.3(1)	11.3(3)T

Table 1-4 WAN Interface Card Options with Cisco IOS Releases for Cisco 1600 Series Routers (continued)

WAN Interface Card	Cisco IOS Release 11.1	Cisco IOS Release 11.2	Cisco IOS Release 11.3	Cisco IOS Release 11.3T
1-Port ISDN BRI S/T[3] Leased Line (WIC-1B-S/T-LL)	–	11.2(9)P	–	11.3(3)T
1-Port 56/64-kbps CSU/DSU (WIC-1DSU-56K4)	–	11.2(12)P	–	11.3(3)T
1-Port T1/FT1 (WIC-1DSU-T1)	–	11.2(12)P	–	11.3(3)T

1 1-Port ISDN BRI U card is not available with Cisco 1603 or Cisco 1604 routers. The BRI U module does not require an external NT1.

2 1-Port ISDN BRI S/T card is not available with Cisco 1603 or Cisco 1604 routers. Some ISDN service providers require an external Network Termination 1 (NT1) device to connect an ISDN S/T port to the ISDN line. If your service provider requires this, you must provide the NT1.

3 1-Port ISDN BRI S/T Leased-line card is only available with Cisco 1603 or Cisco 1604 routers. Some ISDN service providers require an external Network Termination 1 (NT1) device to connect an ISDN S/T port to the ISDN line. If your service provider requires this, you must provide the NT1.

Safety and Regulatory Compliance Information

This section lists safety warnings that you should be aware of before installing a network module or interface card in the router. To see translated version of the safety warnings contains in this guide, refer to the *Cisco Regulatory Compliance and Safety Information* publication that accompanied your router.

This section includes:

- Safety Recommendations on page 1-17
- Safety with Electricity on page 1-18
- Preventing Electrostatic Discharge Damage on page 1-19
- FCC Class B Compliance on page 1-20
- FCC Part 68 on page 1-20

- Industry Canada CS-03 on page 1-22
- European Commission on page 1-23
- Call Progress Tone Settings on page 1-24

Safety Recommendations

Follow these guidelines to ensure general safety:

- Keep the chassis area clear and dust-free during and after installation.
- Put the removed chassis cover in a safe place.
- Keep tools away from walk areas where you or others could fall over them.
- Do not wear loose clothing that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.
- Wear safety glasses when working under any conditions that might be hazardous to your eyes.
- Do not perform any action that creates a potential hazard to people or makes equipment unsafe.

To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied your router.

Safety with Electricity

Warning Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.

Warning To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Both LAN and WAN ports may use RJ-45 connectors. Use caution when connecting cables.

Warning Hazardous network voltages are present in WAN ports regardless of whether power to the router is OFF or ON. To avoid electric shock, use caution when working near WAN ports. When detaching cables, detach the end away from the router first.

Warning Before opening the chassis, disconnect the telephone-network cables to avoid contact with telephone-network voltages.

Warning Do not work on the system or connect or disconnect cables during periods of lightning activity.

Warning Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is OFF and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected.

Follow these guidelines when working on equipment powered by electricity:

- Locate the emergency power-off switch in the room in which you are working. Then, if an electrical accident occurs, you can quickly shut the power OFF.
- Before working on the router, turn OFF the power and unplug the power cord.

- Disconnect all power before doing the following:
  - Installing or removing a router chassis
  - Working near power supplies
- Do not work alone if potentially hazardous conditions exist.
- Never assume that power is disconnected from a circuit. Always check.
- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, and missing safety grounds.
- If an electrical accident occurs, proceed as follows:
  - Use caution; do not become a victim yourself.
  - Turn OFF power to the router.
  - If possible, send another person to get medical aid. Otherwise, determine the condition of the victim and then call for help.
  - Determine if the person needs rescue breathing or external cardiac compressions; then take appropriate action.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. It occurs when electronic printed circuit cards are improperly handled and can result in complete or intermittent failures. Always follow ESD prevention procedures when removing and replacing cards. Ensure that the router chassis is electrically connected to earth ground. Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to safely channel unwanted ESD voltages to ground. To properly guard against ESD damage and shocks, the wrist strap and cord must operate effectively. If no wrist strap is available, ground yourself by touching the metal part of the chassis.

Caution For safety, periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohm (Mohm).

FCC Class B Compliance

The equipment described in this document generates and may radiate radio-frequency energy. If it is not installed in accordance with Cisco's installation instructions, it may cause interference with radio and television reception. This equipment has been tested and found to comply with the limits for a Class B digital device in accordance with the specifications in part 15 of the FCC rules. These specifications are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation.

You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the Cisco equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the equipment to one side or the other of the television or radio.
- Move the equipment farther away from the television or radio.
- Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

Modifications to this product not authorized by Cisco Systems, Inc. could void the FCC approval and negate your authority to operate the product.

FCC Part 68

This equipment complies with Part 68 of the FCC rules. On the front panel of this equipment is a label that contains, among other information, the FCC registration number. If requested, you must provide this information to the telephone company.

An FCC-compliant cord and modular plug is provided with this equipment. This equipment is designed for connection to the telephone network or premises wiring using a compatible modular jack that is Part 68 compliant. See the installation instructions for details.

This equipment cannot be used on telephone company-provided coin service. Connection to party line service is subject to state tariffs.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that it may be necessary to temporarily discontinue service. If advance notice is not practical, the telephone company will notify you as soon as possible. Also, you will be advised of your right to file a complaint with the FCC.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of this equipment. If this happens, the telephone company will provide advance notice for you to make the necessary modifications to maintain uninterrupted service.

This device does not include any upgradeable parts.

This equipment uses Universal Service Order Code (USOC) jacks as listed in Table 1-5.

Table 1-5 WAN Interface Card USOC Jacks

Cisco Product Number	Facility Interface Code	Service Order Code	Jack Type
WIC-1DSU-SW56K4	04DU5-56	6.0N	RJ-48S
WIC-1B-S/T WIC-1ST-CH	02IS5	6.0N	RJ-49C
VIC-2BRI-S/T	02IS5	6.0N	RJ-49C
WIC-1B-U WIC-U-CH	02IS5	6.0N	RJ-49C
WIC-1DSU-T1	04DU9-BN 04DU9-DN 04DU9-1KN 04DU9-1SN	6.0N 6.0N 6.0N 6.0N	RJ48C RJ48C RJ48C RJ48C

Industry Canada CS-03

The following information applies to models used in Canada.

Ringer Equivalence Number

The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices, subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

Equipment Attachment Limitations

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirement Documents. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution Users should not attempt to make connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

See Table 1-6 for additional information.

Table 1-6 Canadian Operating Information

Interface	Connecting Method	Ringer Equivalence Number
VIC-2FXO loop-start trunk interface	CA11, CA48	0.5
VIC-2FXO ground-start trunk interface	CA11, CA48	0.5
VIC-2FXS on-premises station interface	CA11, CA48	0.5
VIC-2E/M on-premises E&M interface	CA11, CA48	0.5
VIC-2BRI-S/T on-premises E&M interface	CB-1B	0.0

Australian Communications Authority Technical Standard 031

The following warning applies to the 2-Port ISDN BRI voice interface card (Cisco product number VIC-2BRI-S/T-TE).

Warning This equipment will be inoperable when mains power fails.

European Commission

The VIC-2FXO-EU voice interface card has been approved to Common Technical Regulation (CTR) 21 for pan-European single-terminal connection to the PSTN. However, because of differences among the PSTNs in different countries, this approval does not, in itself, give unconditional assurance of successful operation on every PSTN network termination point.

In the event of problems, you should first contact your equipment supplier.

Call Progress Tone Settings

VIC-2FXO voice interface cards are available in several versions with interfaces intended for different geographical regions.

There are no hardware settings for connecting these voice interface cards to the public switched telephone network. To comply with national regulatory requirements, you must set call progress tones to the values shown in Table 1-7, using the Cisco IOS **cptone** command.

To set call progress tones for a voice port, enter the following commands in global configuration mode:

```
Router(config)# voice-port slot-number/subunit-number/port
Router(config-voice-port)# cptone setting
```

Table 1-7 Call Progress Tone Settings

Country	Setting	Compliance
Australia	australia	ACA TS 002/TS 003
Canada	northamerica	Industry Canada CS-03
Denmark	dk	–
Germany	de	BAPT 223 ZV 5:July 1996
Great Britain	gb	PD 7020:1996
Hong Kong	hk	HK Telecom CR01 and CR02
Luxembourg	lu	–
Mexico	northamerica	NOM-036-SCT1-1993
Sweden	se	SS 63 63 39
Switzerland	ch	BAKOM 337/2.2
Thailand	th	PTT Subscriber Line Standards
United States	northamerica	FCC Part 68

CHAPTER 2

Installing WAN and Voice Interface Cards in a Cisco Modular Router

This chapter describes how to install WAN and voice interface cards in Cisco 3600 series, 2600 series, 1600 series, and Cisco 1720 modular routers, and contains the following sections:

- Required Tools and Equipment on page 2-1
- Installing a Network Module in a Cisco 3600 Series or Cisco 2600 Series Router on page 2-2
- Before Installing a Voice Interface Card on page 2-5
- Installing a WAN or Voice Interface Card in a Network Module or Chassis Slot on page 2-6
- Installing a WAN Interface Card in a Cisco 1720 Router or Cisco 1600 Series Router on page 2-9

Required Tools and Equipment

In addition to the WAN interface card and the router, you need the following items to install and connect your card:

- Number 2 Phillips screwdriver.
- Appropriate connecting cable—The cable type required for each card is described in the section for that card. For more information on the types of cables that can be used with the cards, See the online document *Cisco Modular Router Cable Specifications* on the Documentation CD-ROM that accompanied your router package, or on Cisco Connection Online.

- Asynchronous modem (serial card only)—Used to connect the WAN interface card to an analog telephone line.
- Synchronous modem, channel service unit/data service unit (DSU/CSU), or other data circuit-terminating equipment (DCE) (serial card only)—Used to connect the WAN interface card to a digital WAN line.
- External NT1 (ISDN BRI S/T and ISDN BRI S/T Leased-Line cards only)—Used to connect the WAN interface card to an ISDN interface.

Installing a Network Module in a Cisco 3600 Series or Cisco 2600 Series Router

This section describes how to install a network module (for WAN or voice interface cards) in a Cisco 3600 series or Cisco 2600 series router.

To install a WAN or voice interface card in a network module or to install a WAN interface card in a Cisco 2600 series chassis slot, see the “Before Installing a Voice Interface Card” section on page 2-5.

To install a WAN interface card in a Cisco 1720 router or Cisco 1600 series router, see the “Installing a WAN Interface Card in a Cisco 1720 Router or Cisco 1600 Series Router” section on page 2-9.

Warning Only trained and qualified personnel should be allowed to install or replace this equipment.

Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position.

Warning You can install modules in the chassis either before or after mounting the router. If possible, install the modules with the router in the position that provides the best access to the rear panel. You can install any module into any available slot in the chassis.

Caution Do not insert a module into a slot when power is ON or network cables are connected.

Note Do not install an ISDN BRI WAN interface card or an ISDN BRI network module in the same chassis as an ISDN PRI network module. This configuration is not supported.

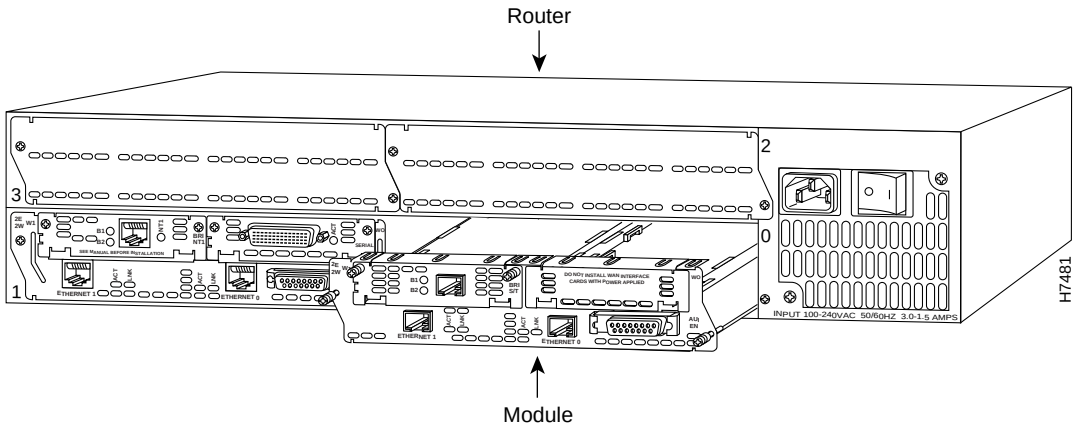
To install a network module in a Cisco 3600 series or Cisco 2600 series router:

Step 1 Power OFF the router. However, to channel ESD voltages to ground, do not unplug the power cable. Remove all network interface cables, including telephone cables, from the rear panel.

Step 2 Use a Phillips or flat-blade screwdriver to remove the blank filler panel from the slot where you plan to install the module. Save the filler panel for possible future use.

Step 3 Align the module with the guides in the chassis and slide it gently into the slot. (See Figure 2-1.)

Figure 2-1 Installing a Network Module in a Modular Router (typical)



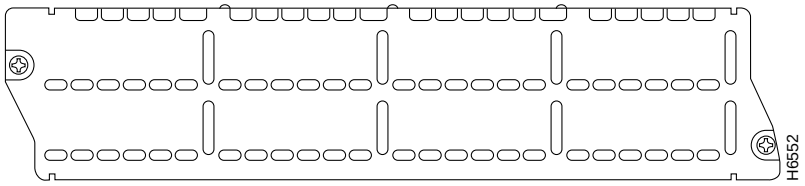
Step 4 Push the module into place until the edge connector is securely seated in the connector on the motherboard. Ensure that each of the module's captive screws lines up with its corresponding hole in the chassis.

Step 5 Secure the captive mounting screws into the holes of the chassis using a Phillips or flat-blade screwdriver.

Network Module Filler Panels

If you are installing a network module in a Cisco 3600 series router, and the router is not fully configured with modules, you must fill the open slots with slot filler panels (see Figure 2-2) to ensure proper airflow.

Figure 2-2 Network Module Slot Filler Panel



Before Installing a Voice Interface Card

This section contains additional information that you need before installing a voice interface card in a voice network module installed in a Cisco 3600 series or Cisco 2600 series router

A voice connection requires both a voice network module and a voice interface card. Voice interface cards are installed in voice network modules only, and do not install directly into the router chassis. At least one other network module or WAN interface card must be installed in the router to provide the connection to the IP LAN or WAN. For instructions on how to install a network module, see the “Installing a Network Module in a Cisco 3600 Series or Cisco 2600 Series Router” section on page 2-2.

Caution Although voice interface cards physically resemble WAN interface cards, voice and WAN interface cards are not interchangeable. Voice interface cards cannot be installed in a WAN interface card slot or a two-slot network module, and WAN interface cards cannot be installed in a voice network module.

For instructions on inserting a voice interface card into a voice network module, see the “Installing a WAN or Voice Interface Card in a Network Module or Chassis Slot” section on page 2-6.

Installing a WAN or Voice Interface Card in a Network Module or Chassis Slot

This section describes how to install a WAN or voice interface card in a two-slot network module (used in Cisco 3600 series and Cisco 2600 series routers), or how to install a WAN interface card in a Cisco 2600 series chassis slot (see Figure 2-3).

If you need to install the network module, see the "Installing a Network Module in a Cisco 3600 Series or Cisco 2600 Series Router" section on page 2-2.

You can install WAN interface cards either before or after mounting the router, whichever is more convenient. Similarly, you can install WAN or voice interface cards in the network module either before or after installing the network module in the router chassis.

Caution WAN and voice interface cards do not support online insertion and removal (hot swapping). Before inserting a card into the network module or router chassis, you must turn OFF electrical power and disconnect network cables.

Caution Although voice interface cards physically resemble WAN interface cards, voice and WAN interface cards are not interchangeable. Voice interface cards cannot be installed in a WAN interface card slot or a two-slot network module, and WAN interface cards cannot be installed in a voice network module.

Follow this procedure to install cards in a network module or a Cisco 2600 series WAN interface card chassis slot:

Step 1 Turn OFF power to the router. However, to channel ESD voltages to ground, do not unplug the power cable. Remove all network interface cables, including telephone cables, from the rear panel.

The following warning applies to routers that use a DC power supply.

Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position.

Note If you are installing a single WAN interface card in a Cisco 2600 series router, use slot W0 first. (See Figure 2-3.)

The Cisco 2600 series router first checks slot W0 before it checks slot W1. If you fill slot W1 while leaving slot W0 vacant, your router configuration could be affected.

Step 2 Using either a number 2 Phillips screwdriver or a small flat-blade screwdriver to remove the blank filler panel from the network module slot or chassis card slot where you plan to install the card. Save the filler panel for future use.

Note The voice network module slots are numbered V0, on the right, and V1, on the left.

Step 3 Align the card with the guides in the two-slot network module or WAN interface card slot and slide it gently into the slot. (Figure 2-4 shows a 1-port serial WAN interface card.)

Step 4 Push the card into place until you feel its edge connector mate securely with the connector in the two-slot network module or WAN interface card slot.

Step 5 Fasten the card's captive mounting screws into the holes in the network module faceplate or WAN interface card slot, using the Phillips or flat-blade screwdriver.

Step 6 If the router was previously running, reinstall the network interface cables and turn ON power to the router.

The following warning applies to routers that use a DC power supply:

Warning After wiring the DC power supply, remove the tape from the circuit breaker switch handle and reinstate power by moving the handle of the circuit breaker to the ON position.

Figure 2-3 Cisco 2600 Series WAN Interface Card Chassis Slot Locations

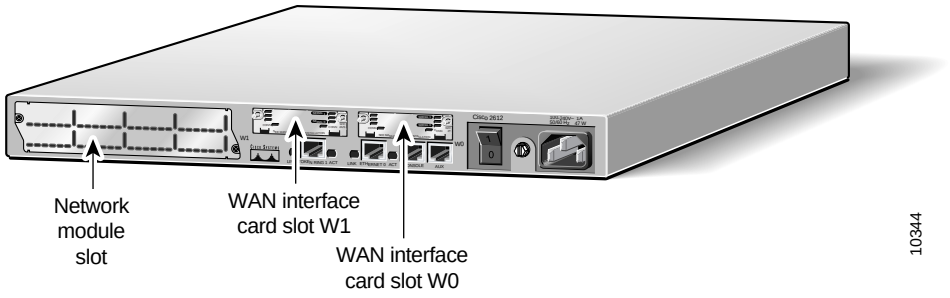
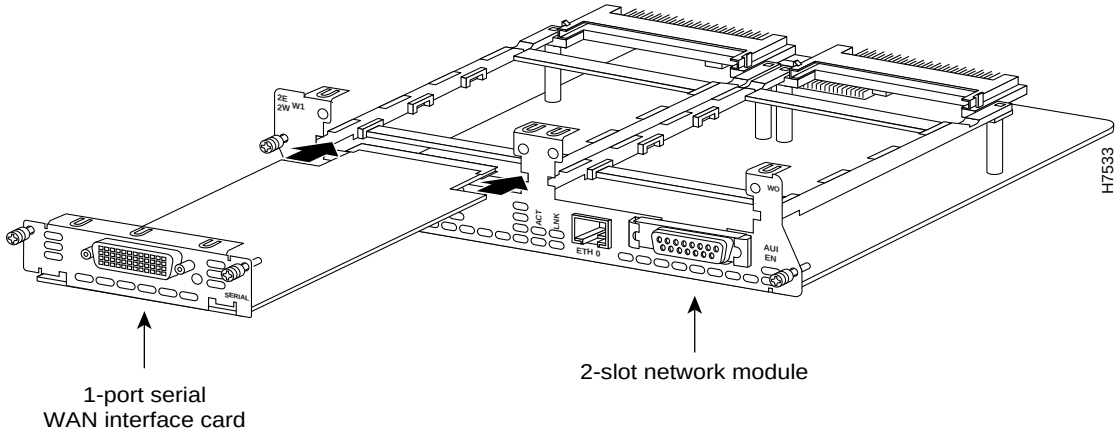


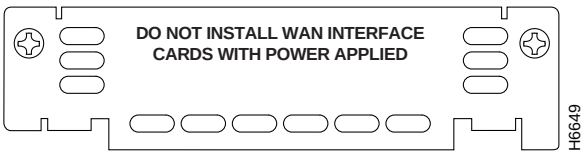
Figure 2-4 Installing a Serial WAN Interface Card in a Two-Slot Network Module



WAN Interface Card Filler Panels

If any interface card slot (on the network module or chassis) is unoccupied, install a filler panel to enable proper airflow. (See Figure 2-5.)

Figure 2-5 WAN or Voice Interface Card Slot Filler Panel



When you have finished installing interface cards in the network module or chassis slots, proceed to Chapter 3, “Connecting WAN and Voice Interface Cards to a Network.”

Installing a WAN Interface Card in a Cisco 1720 Router or Cisco 1600 Series Router

This section describes how to install a WAN interface card in a Cisco 1720 router or Cisco 1600 series router.

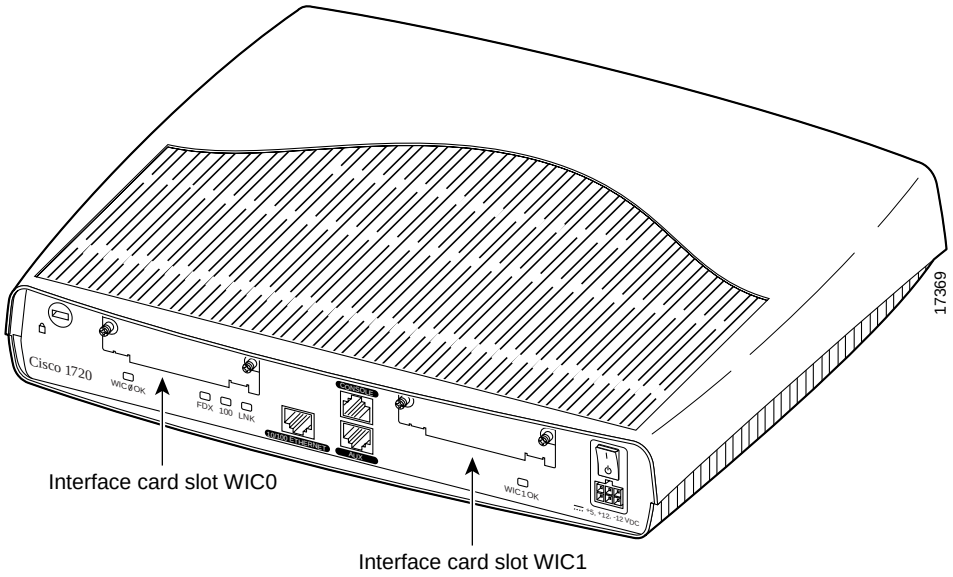
To install a WAN interface card in a Cisco 3600 series or Cisco 2600 series router, see the “Installing a Network Module in a Cisco 3600 Series or Cisco 2600 Series Router” section on page 2-2, or the “Before Installing a Voice Interface Card” section on page 2-5.

Note The Cisco 1720 router contains two WAN interface card slots, WIC0 and WIC1. (See Figure 2-6.)

The router first checks slot WIC0 before it checks slot WIC1. A single card installed in WIC1 could affect your router configuration.

If you are installing a single WAN interface card in the router, install the card in the WIC0 slot.

Figure 2-6 WAN Interface Card Slots in the Cisco 1720 Router



You can install WAN interface cards either before or after mounting the router, whichever is more convenient.

Caution WAN interface cards do not support online insertion and removal (hot swapping). Before inserting a WAN interface card into the router chassis, you must turn OFF electrical power and disconnect network cables.

Inserting the Card in the Router

Note The figures in this section show a Cisco 1600 series router, but the installation sequence described applies to the Cisco 1720 router as well as Cisco 1600 series routers.

Follow this procedure to install the WAN interface card in the router:

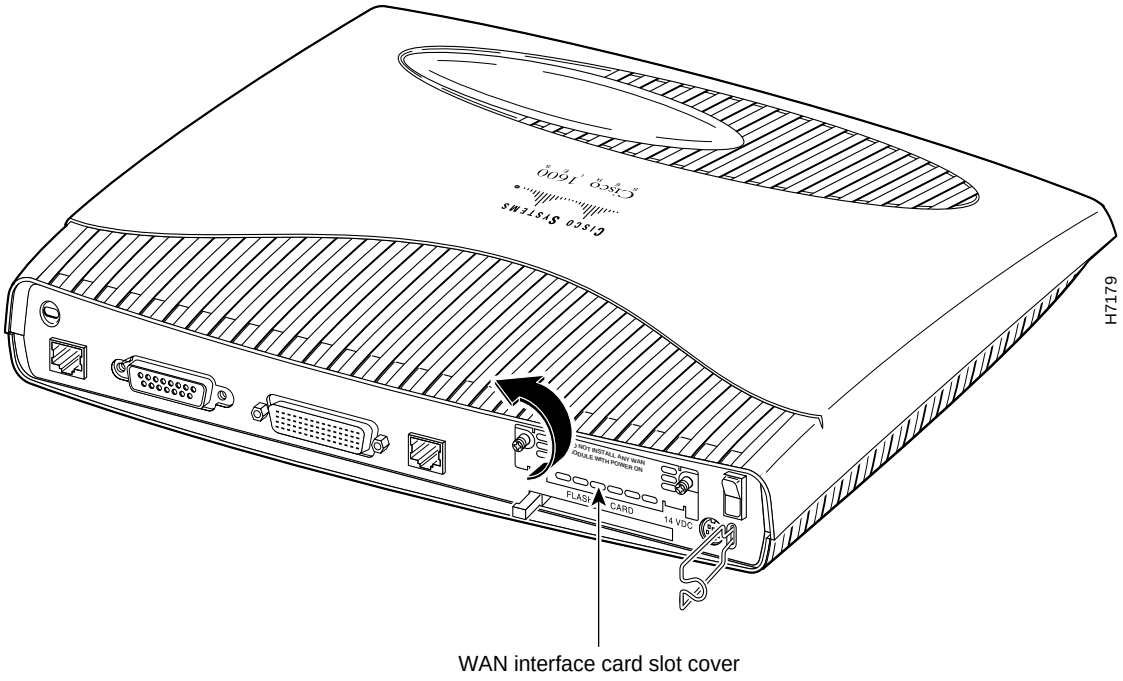
Step 1 On the Cisco 1720 router, turn the power switch to the STANDBY position, and disconnect the power cable from the power socket on the rear panel.

On a Cisco 1600 series router, turn OFF power to the router. However, to channel ESD voltages to ground, do not unplug the power cable.

Step 2 Remove all network interface cables, including telephone cables, from the rear panel.

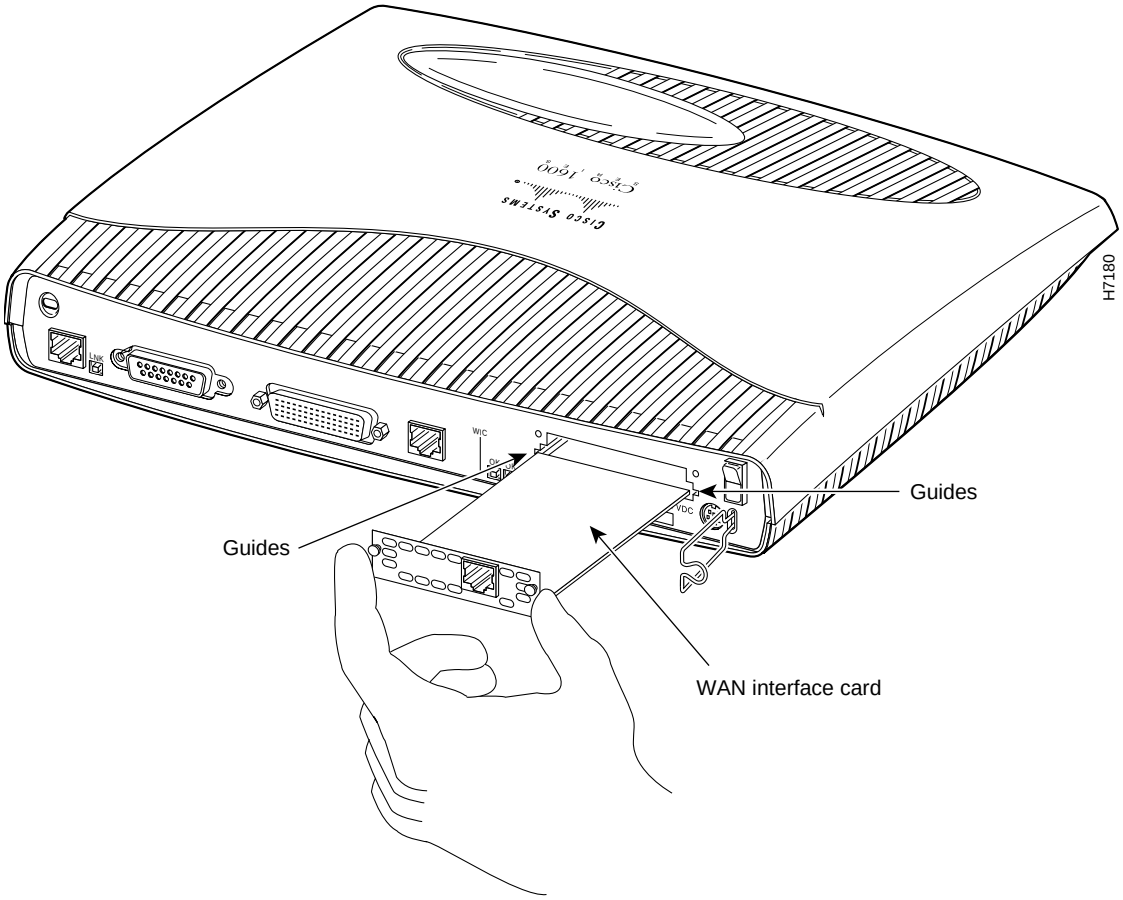
Step 3 Use either a number 2 Phillips screwdriver or a small flat-blade screwdriver to remove the filler panel from the WAN interface card slot. (See Figure 2-7.) Save the filler panel for future use.

Figure 2-7 Removing the Slot Cover



Step 4 Align the card with the guides and slide it gently into the WAN interface card slot. (See Figure 2-8.)

Figure 2-8 Inserting a WAN Interface Card



Step 5 Push the card into place until you feel its edge connector mate securely with the connector in the router chassis.

Step 6 Fasten the card's captive mounting screws into the chassis using the Phillips or flat-blade screwdriver.

Note If any WAN interface card slot on the chassis is unoccupied, install a filler panel to enable proper airflow.

Step 7 If the router was previously running, reinstall the network interface cables and turn ON power to the router.

After installing the WAN interface card into the router, proceed to Chapter 3, "Connecting WAN and Voice Interface Cards to a Network."

CHAPTER 3

Connecting WAN and Voice Interface Cards to a Network

This chapter describes how to connect Cisco WAN interface cards to a network and contains the following sections:

- Serial Cards on page 3-1
- 1-Port ISDN BRI Cards on page 3-6
- 1-Port ISDN BRI S/T Leased-Line Card on page 3-15
- 1-Port 56/64-kbps DSU/CSU Card on page 3-18
- 1-Port T1/FT1 DSU/CSU Card on page 3-20
- Voice Interface Cards on page 3-23

Serial Cards

This section describes the following Cisco WAN interface cards:

- 1-Port and 2-Port Serial Cards on page 3-1
- 2-Port Asynchronous/Synchronous Serial Card on page 3-3

1-Port and 2-Port Serial Cards

The 1-port serial WAN interface card, shown in Figure 3-1, and the 2-port serial WAN interface cards, shown in Figure 3-2, provide an EIA/TIA-232, EIA/TIA-449, V.35, X.21, data terminal equipment/data communications equipment (DTE/DCE), EIA-530 DTE, or nonreturn to zero/nonreturn to zero inverted (NRZ/NRZI) serial interface to a Cisco modular router.

Note In Cisco 3600 and Cisco 2600 series routers, the 1-port and 2-port serial WAN interface cards support synchronous data rates up to 2.048 mbps.

In the Cisco 1720 router, the 1-port and 2-port serial WAN interface cards support both asynchronous and synchronous data rates up to 2.048 mbps.

In Cisco 1600 series routers, the 1-port serial WAN interface cards support asynchronous data rates up to 115.2 kbps, and synchronous data rates up to 2.048 mbps.

Each serial card has one LED, labeled CONN for each port, which lights when the serial port is connected. When the port is in DTE mode, the CONN LED indicates that Data Send Ready (DSR), Data Carrier Detect (DCD), and Clear To Send (CTS) have been detected. When the port is in DCE mode, it indicates that Data Terminal Ready (DTR) and Ready To Send (RTS) have been detected.

Figure 3-1 1-Port Serial WAN Interface Card—Front Panel

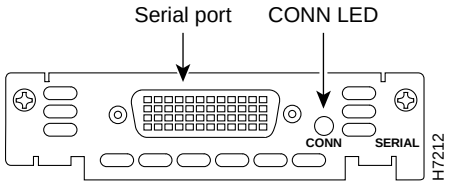
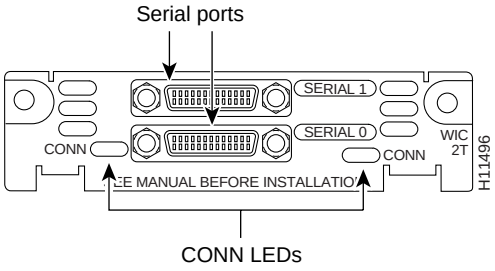


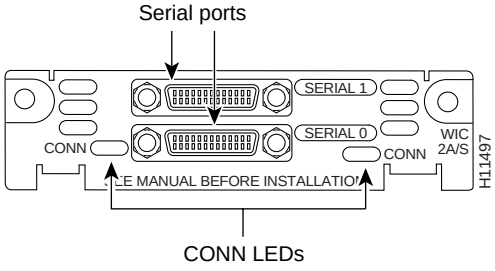
Figure 3-2 2-Port Serial WAN Interface Card—Front Panel



2-Port Asynchronous/Synchronous Serial Card

The 2-port asynchronous/synchronous (A/S) WAN interface card, shown in Figure 3-3, provides an EIA/TIA-232, EIA/TIA-449, V.35, X.21, DTE/DCE, EIA-530, or EIA-530A serial interface to a Cisco modular router. The 2-port A/S WAN interface card supports asynchronous data rates up to 133.6 kbps and synchronous data rates up to 128 kbps.

Figure 3-3 2-Port A/S Serial WAN Interface Card—Front Panel



Connecting Serial WAN Interface Cards to a Network

The 1-port and 2-port serial WAN interface cards use a universal high-density 60-pin receptacle. The serial cable attached to this receptacle determines the port's electrical interface type and mode (DTE or DCE).

Types of Serial Cables

Six types of serial cables (also called serial adapter cables or serial transition cables) are available from Cisco Systems:

- EIA/TIA-232 serial cable assembly
- EIA/TIA-449 serial cable assembly
- V.35 serial cable assembly
- X.21 serial cable assembly
- EIA/TIA-530 serial cable assembly
- EIA/TIA-530A serial cable assembly

For more information on serial cable assemblies, refer to the hardware installation guide that accompanied your router package.

All serial cables provide a universal plug at the interface card end. The network end of each cable provides the physical connectors most commonly used for the interface. For example, the network end of the EIA/TIA-232 serial cable is a DB-25 connector, the most widely used EIA/TIA-232 connector.

All serial interface types except EIA-530 are available in DTE or DCE format: DTE with a plug connector at the network end and DCE with a receptacle at the network end. V.35 is available in either mode with either gender at the network end. EIA-530 is available in DTE only.

Connecting the Card to the Network

After you install the serial WAN interface card, use the appropriate serial cable to connect the interface card's DB-60 serial port to one of the following types of equipment (see Figure 3-4):

- An asynchronous modem, if connecting to an analog telephone line
- A synchronous modem, data service unit/channel service unit (DSU/CSU), or other DCE, if connecting to a digital WAN line

Note Cisco 3600 and Cisco 2600 series routers support only synchronous modems; the Cisco 1720 router and Cisco 1600 series routers support both synchronous and asynchronous modems.

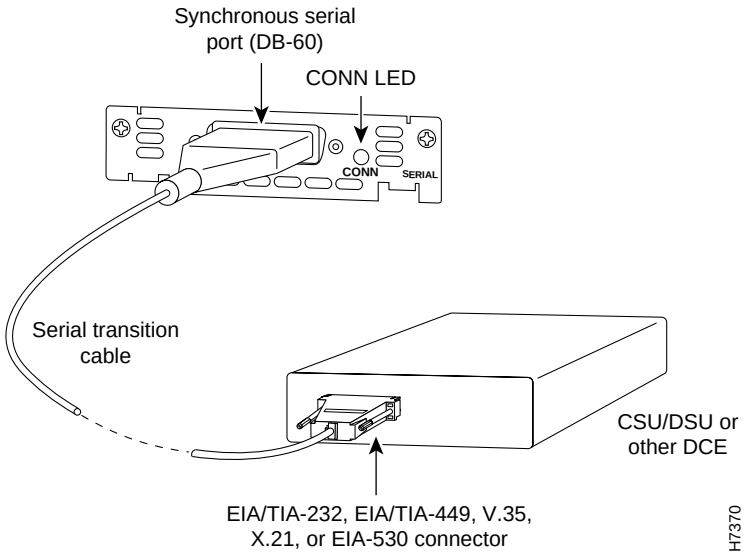
Take the following steps to connect the serial card to the WAN:

Step 1 Confirm that the router is still turned OFF.

Step 2 Connect one end of the appropriate serial cable to the card's DB-60 port.

Step 3 Connect the other end of the cable to the appropriate type of equipment, as shown in Figure 3-4.

Figure 3-4 Connecting the Serial WAN Port to a Modem or DSU/CSU



Step 4 Turn ON power to the router by pressing the power switch to the ON (|) position.

Step 5 Check that the CONN LED goes on, which indicates that the card's serial port detects the WAN serial connection.

If you have additional cards to install, proceed to the appropriate section(s) in this manual. When you have finished all installations, see the software configuration guide that shipped with your hardware.

1-Port ISDN BRI Cards

This section describes the following Cisco ISDN BRI WAN interface cards:

- 1-Port BRI S/T WAN Cards (WIC36-1B-S/T, WIC-1B-S/T) on page 3-7
- 1-Port BRI with NT1 WAN Cards (WIC36-1B-U, WIC-1B-U) on page 3-7

You can distinguish between WIC36 and WIC models of a BRI WAN interface card by the location and labeling of the LEDS, and the number and location of cutouts in the faceplate.

1-Port BRI S/T WAN Cards (WIC36-1B-S/T, WIC-1B-S/T)

The 1-Port ISDN-BRI WAN interface cards (WIC36-1B-S/T, WIC-1B-S/T) connect to an ISDN WAN through an external NT1 device. (See Figure 3-5 and Figure 3-6.) This interface is also known as an S/T interface.

1-Port BRI with NT1 WAN Cards (WIC36-1B-U, WIC-1B-U)

The 1-Port ISDN-BRI with NT1 WAN interface cards (WIC36-1B-U, WIC-1B-U) connect to an ISDN WAN using a built-in NT1 device. (See Figure 3-7 and Figure 3-8.) This interface is also known as a U interface.

Figure 3-5 1-Port ISDN BRI WAN Interface Card (S/T Interface) (WIC36-1B-S/T)

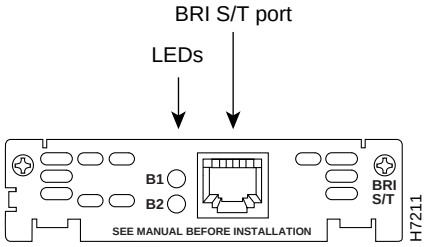


Figure 3-6 1-Port ISDN BRI WAN Interface Card (S/T Interface) (WIC-1B-S/T)

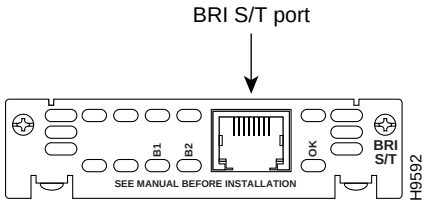


Figure 3-7 1-Port ISDN BRI with NT1 WAN Interface Card (U Interface) (WIC36-1B-U)

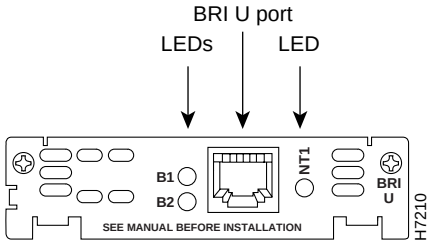
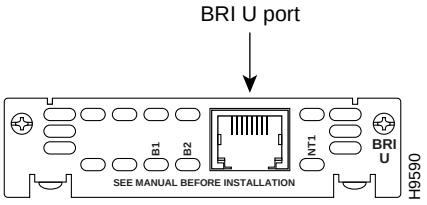


Figure 3-8 1-Port ISDN-BRI with NT1 WAN Interface Card (U Interface) (WIC-1B-U)



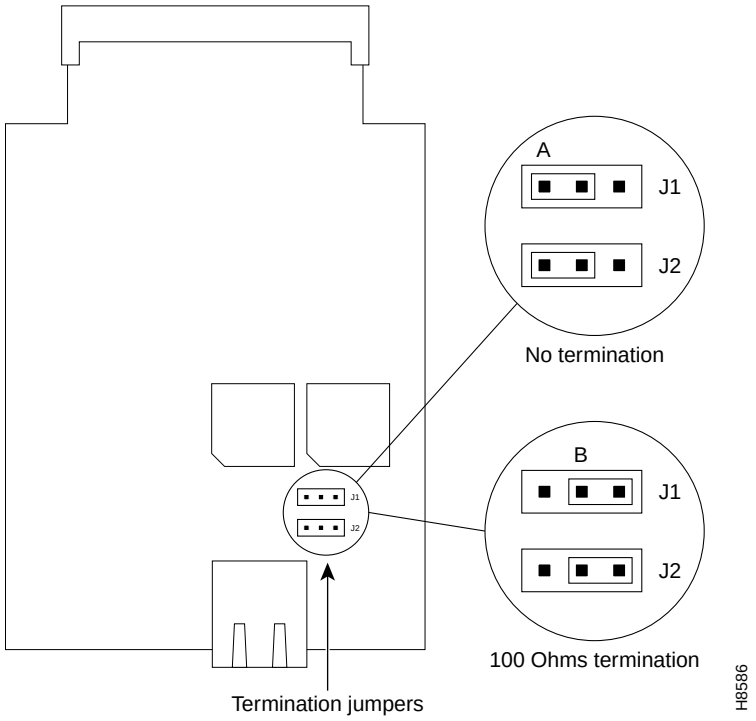
Setting Jumpers on ISDN BRI Cards

The older BRI S/T WAN interface cards (product numbers WIC36-1B-S/T, WIC36-1B-U, CPAWIC36-1B-S/T, CPAWIC36-1B-U) have two termination jumpers, labeled J1 and J2. Before installing this card, ensure that the termination jumpers are set appropriately for your installation.

The jumpers are factory-configured in the B position (100-ohms termination). Keep the jumpers in this position to use the BRI S/T WAN interface card in a point-to-point connection or as the last device on the line of a passive-bus connection. Set the termination jumpers to the A position to use the BRI S/T WAN interface card in a passive-bus connection where it is not the last device on the line. The jumpers are shown in Figure 3-9.

The newer BRI interface cards (product numbers WIC-M1B-S/T or WIC-M1B-U) do not have termination jumpers.

Figure 3-9 Termination Jumpers on the Older BRI S/T WAN Interface Card



Connecting ISDN BRI Cards

Note The older BRI WAN interface cards mount only in the W1 slot of a two-slot module and provide a single BRI interface. The newer BRI WAN interface cards can mount in either slot of a two-slot module.

For more information on BRI network modules, see the publication *Cisco Network Modules Hardware Installation Guide*.

Warning Network hazardous voltages are present in the BRI cable. If you detach the BRI cable, detach the end away from the router first to avoid possible electric shock. Network hazardous voltages also are present on the system card in the area of the BRI port (RJ-45 connector), regardless of when power is turned OFF. (To see translated versions of this warning, see the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Warning The ISDN connection is regarded as a source of voltage that should be inaccessible to user contact. Do not attempt to tamper with or open any public telephone operated (PTO)-provided equipment or connection hardware. Any hardwired connection (other than by a nonremovable, connect-one-time-only plug) must be made only by PTO staff or suitably trained engineers. (To see translated versions of this warning, see the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Use a BRI cable (not included) to connect the BRI WAN interface card directly to an ISDN. See the online document *Cisco Modular Access Router Cable Specifications* for pinouts. This document is located on both the Documentation CD-ROM that accompanied your router package, and Cisco Connection Online.

Take the following steps to connect an ISDN BRI S/T WAN interface card to an NT1 device:

Step 1 Confirm that the router is still turned OFF.

Step 2 Connect one end of a straight-through RJ-45-to-RJ-45 cable to the card's RJ-45 connector.

Step 3 Connect the other end of the cable to the NT1, as shown in Figure 3-10.

Step 4 Connect the NT1 to the ISDN wall jack according to the documentation that came with the NT1.

Step 5 Turn ON power to the router.

Take the following steps to connect an ISDN BRI with NT1 WAN interface card to an ISDN network:

Step 1 Confirm that the router is still turned OFF.

Step 2 Connect one end of a straight-through RJ-45-to-RJ-45 cable to the card's RJ-45 connector.

Step 3 Connect the other end of the cable directly to the ISDN wall jack as shown in Figure 3-11.

Step 4 Turn ON power to the router.

Figure 3-10 Connecting a BRI S/T WAN Interface Card to an NT1

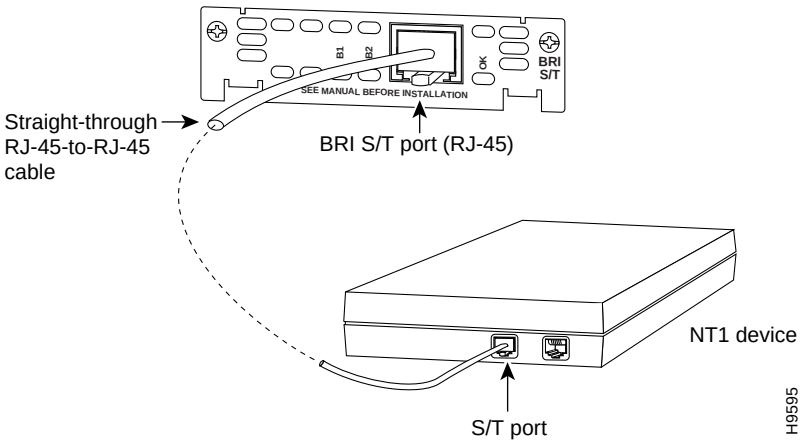
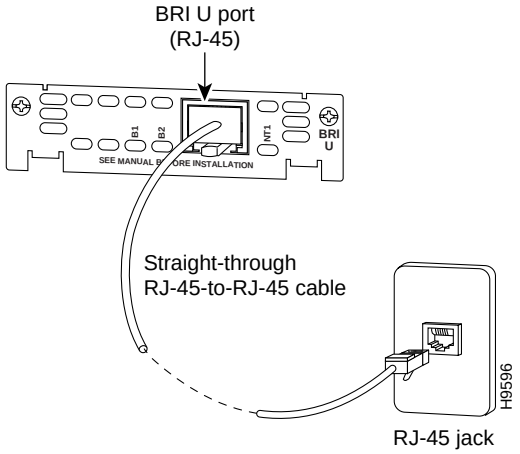


Figure 3-11 Connecting a BRI U WAN Interface Card to an ISDN Outlet



BRI WAN Interface Card LEDs

BRI S/T WAN interface cards have three LEDs, shown in Figure 3-12 for WIC-1B-S/T and Figure 3-13 for the WIC36-1B-S/T, and described in Table 3-1. The B1 and B2 LEDs indicate call activity on the two ISDN BRI B channels. The OK LED indicates that the ISDN port has synchronized with the central office switch (the D channel is active).

Figure 3-12 ISDN BRI S/T WAN Interface Card LEDs (WIC-1B-S/T)

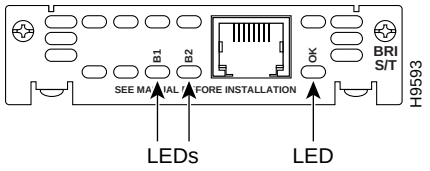


Figure 3-13 ISDN BRI S/T WAN Interface Card LEDs (WIC36-1B-S/T)

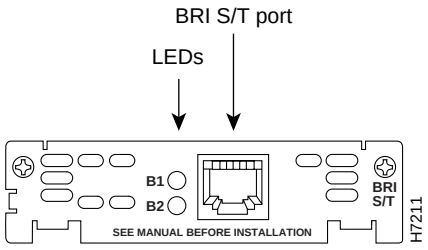


Table 3-1 BRI S/T WAN Interface Card LEDs

LED	Meaning
B1	Active connection on B1 channel.
B2	Active connection on B2 channel.
OK	ISDN port has established a connection with the central office switch.

BRI U WAN interface cards also have three LEDs, shown in Figure 3-14 for WIC-1B-U and Figure 3-15 for WIC36-1B-U, and described in Table 3-2. The B1 and B2 LEDs indicate call activity on the two ISDN BRI B channels. The NT1 LED indicates synchronization status of the NT1.

Figure 3-14 ISDN BRI U WAN Interface Card LEDs (WIC-1B-U)

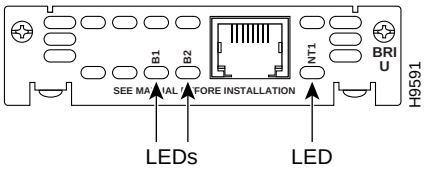


Figure 3-15 ISDN BRI U WAN Interface Card LEDs (WIC36-1B-U)

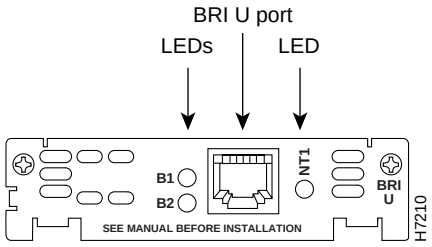


Table 3-2 ISDN BRI U WAN Interface Card LEDs

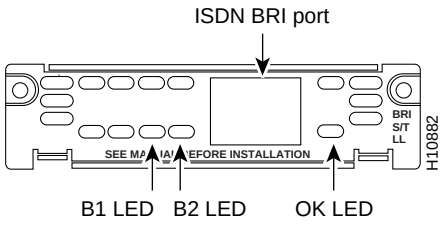
LED	Meaning
B1	Active connection on B1 channel.
B2	Active connection on B2 channel.
NT1	NT1 has established a connection with the central office switch.

If you have additional cards to install, proceed to the appropriate section(s) in this manual. When you have finished all installations, see the software configuration guide that shipped with your hardware.

1-Port ISDN BRI S/T Leased-Line Card

The ISDN BRI S/T Leased-Line card provides a single B channel operating in leased-line mode. (See Figure 3-16.)

Figure 3-16 ISDN BRI S/T Leased-Line Card—Front Panel



Connecting the ISDN BRI S/T Leased-Line Card to the Network

You must provide an RJ-45-to-RJ-45 cable and an external NT1 for this connection.

Note Turn the router OFF before making cable connections to the WAN interface card ISDN BRI S/T leased-line port.

Take the following steps to connect the ISDN cables:

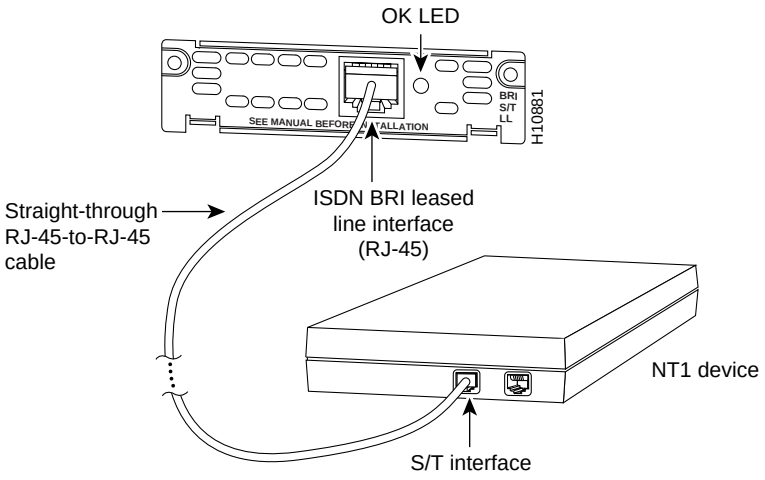
Step 1 Confirm that the router is still turned OFF.

Step 2 Connect one end of the RJ-45 cable to the card's ISDN BRI leased-line port.

Step 3 Connect the other end of the cable to the NT1, as shown in Figure 3-17.

Step 4 Connect the NT1 to the ISDN wall jack according to the documentation that came with the NT1.

Figure 3-17 Connecting the ISDN BRI S/T Leased-Line Card to the NT1



Step 5 Turn ON power to the router by pressing the power switch to the ON (|) position.

Step 6 Check that the OK LED goes on, which indicates that the card's ISDN port has synchronized with the central office switch.

Configuring the ISDN BRI S/T Leased-Line Interface

After you connect the ISDN cable, you can configure the ISDN interface. The leased-line WAN interface card supports a 64-kbps leased line on the B1 channel only. The WAN interface card is automatically configured in leased-line mode. Refer to the software configuration guide that came with your router for information on how to configure the ISDN interface.

ISDN BRI S/T Leased-Line WAN Interface Card LEDs

ISDN BRI S/T Leased-Line card has three LEDs, which are described in Table 3-3.

Table 3-3 ISDN BRI S/T Leased Line Card LEDs

LED	Meaning
B1	ISDN connection on B1 channel.
B2[1]	ISDN connection on B2 channel.
OK	ISDN port has synchronized with the central office switch.

1 Always off for 64 kbps, which is available on B1 only.

If you have additional cards to install, proceed to the appropriate section(s) in this manual. When you have finished all installations, see the software configuration guide that shipped with your hardware.

1-Port 56/64-kbps DSU/CSU Card

The 1-port 56/64-kbps WAN interface card includes an integral DSU/CSU and can be configured to provide circuit-switched, dedicated, or leased-line service at 56 kbps. This card also supports 64-kbps dedicated lines.

Connecting the 56/64-kbps Card to the Network

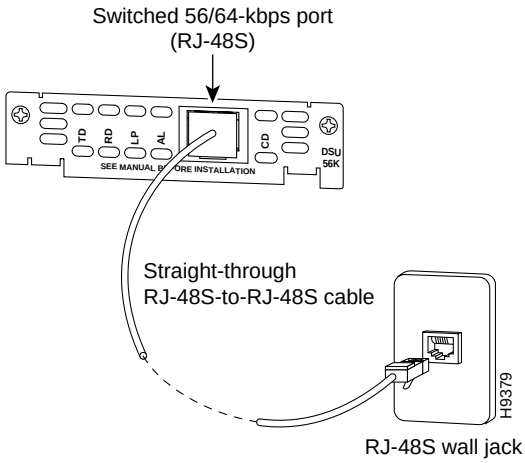
You must provide a straight-through RJ-48S-to-RJ-48S or a straight-through RJ-45-to-RJ-45 cable for this connection.

Step 1 Confirm that the router is OFF.

Step 2 Connect one end of the cable to the card's 56/64-kbps port.

Step 3 Connect the other end to the 56/64-kbps services wall jack, as shown in Figure 3-18.

Figure 3-18 Connecting the 56/64-kbps Card to an RJ-48S Jack



56/64-kbps WAN Interface Card LEDs

The 56/64-kbps card has five LEDs, which are shown in Figure 3-19 and described in Table 3-4.

Figure 3-19 56/64-kbps Card Front Panel

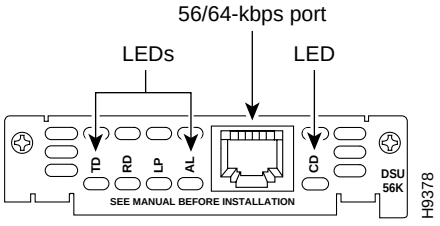


Table 3-4 56/64-kbps Card LEDs

LED	Meaning
TD	Data is being transmitted to the DTE interface.
RD	Data is being received from the DTE interface.
LP	Internal DSU/CSU is in loopback mode.
AL	One of these alarm conditions is present: no receive signal, loss of frame signal from the remote station, or out of service signal from the remote station. This LED is off during normal operation.
CD	Internal DSU/CSU in the WAN interface card is communicating with another DSU/CSU.

If you have additional cards to install, proceed to the appropriate section(s) in this manual. When you have finished all installations, see the software configuration guide that shipped with your hardware.

1-Port T1/FT1 DSU/CSU Card

The 1-port T1/Fractionalized T1 (FT1) WAN interface card includes an integrated data service unit/channel service unit (DSU/CSU) and can be configured for either full T1 or fractionalized T1 services.

Connecting the T1/FT1 Card to the Network

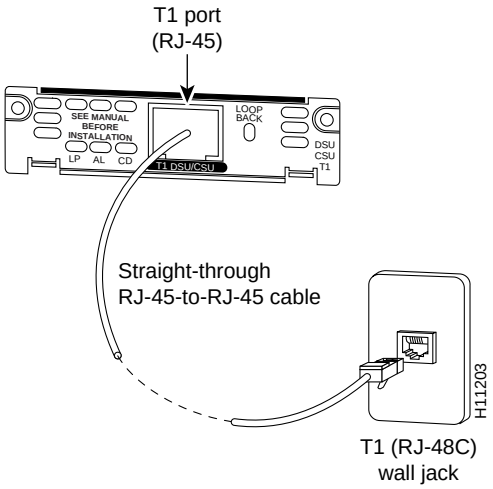
For this connection, use the straight-through RJ-45-to-RJ-45 cable that came with your card.

Step 1 Confirm that the router is still turned OFF.

Step 2 Connect one end of the cable to the T1 port on the card.

Step 3 Connect the other end to the T1 wall jack (RJ-48C) at your site, as shown in Figure 3-20.

Figure 3-20 Connecting the T1/FT1 Card to the T1 Wall Jack



Step 4 Turn ON power to the router.

Step 5 Check that the CD LED goes on, which means that the card's internal DSU/CSU is communicating with the DSU/CSU at the T1 service provider's central office.

T1/FT1 WAN Interface Card LEDs

The T1/FT1 card has three LEDs and a loopback button, which are shown in Figure 3-21 and described in Table 3-5.

Figure 3-21 T1/FT1 Card—Front Panel

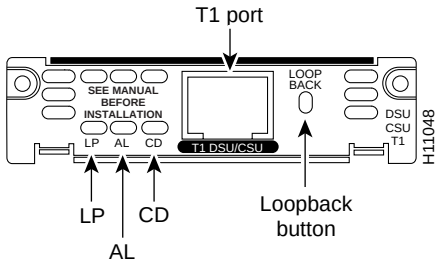


Table 3-5 T1/FT1 Card LEDs and Button

Feature	Color	Description
LP LED	Yellow	Line or loopback state is detected or is manually set by the user.
	Off	Normal operation.
AL LED	Red	No receive signal.
	Yellow	Remote station has an alarm condition.
	Blue	The remote station is probably out of service. If the remote station is an IOS-based router, its interface may be shut down.
	Off	Normal operation.
CD LED	Green	Internal DSU/CSU in the WAN interface card is communicating with another DSU/CSU. This LED is on during normal operation.

Table 3-5 T1/FT1 Card LEDs and Button (continued)

Feature	Color	Description
Loopback button		Push this button to place the WAN interface card into loopback mode. The service provider can send a signal to test the connection from your site to the central office switch. Push this button again to turn loopback mode off.

If you have additional cards to install, proceed to the appropriate section(s) in this manual. When you have finished all installations, see the software configuration guide that shipped with your hardware.

Voice Interface Cards

Voice network modules convert telephone voice signals into a form that can be transmitted over an IP network, and have no connectors. Voice interface cards provide the connection to the telephone equipment or network.

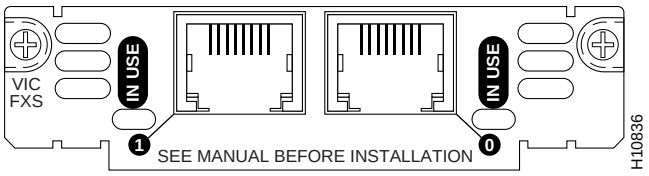
This section contains the following topics:

- 2-Port FXS Card on page 3-23
- 2-Port FXO Card on page 3-25
- 2-Port E&M Card on page 3-27
- 2-Port FXS, FXO, and E&M Card LEDs on page 3-29
- 2-Port ISDN BRI Card on page 3-30

2-Port FXS Card

A Foreign Exchange Station (FXS) interface connects directly to a standard telephone, fax machine, or similar device. This interface supplies ringing voltage, dial tone, and so on to the station. The ports are shown in Figure 3-22.

Figure 3-22 2-Port FXS Card Front Panel



Connecting the 2-Port FXS Card

Use a standard RJ-11 modular telephone cable to connect this card to a telephone or fax machine.

Note Ports on this interface card are color-coded gray.

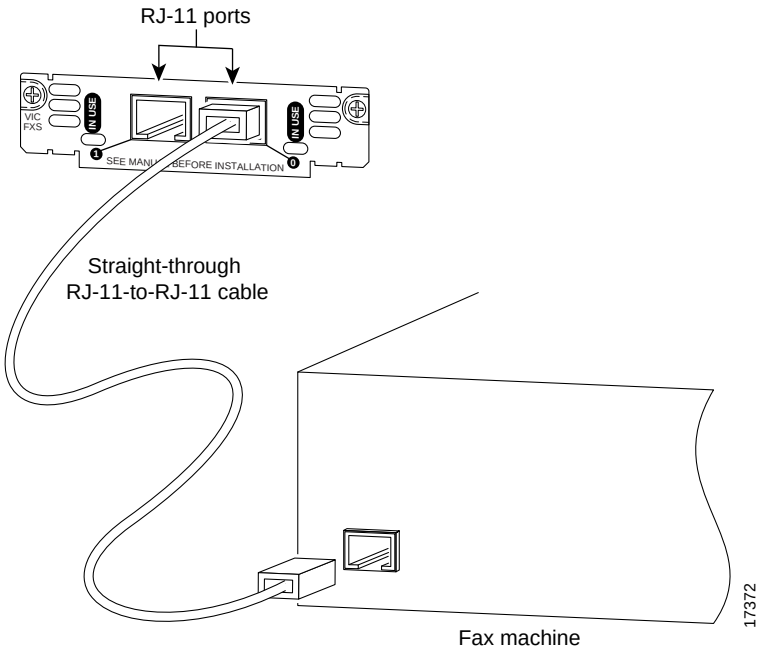
Step 1 Confirm that the router is still turned OFF.

Step 2 Connect one end of the cable to an RJ-11 port on the card. (See Figure 3-23.)

Step 3 Connect the other end to the RJ-11 port on the telephone or fax machine.

Caution Do not connect an FXS interface directly to the public switched telephone network.

Figure 3-23 Connecting the 2-Port FXS Card



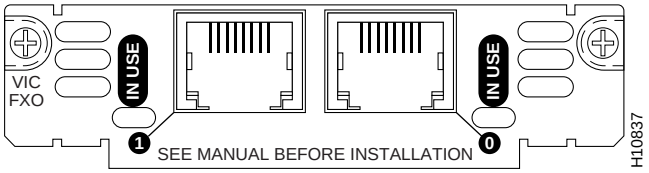
2-Port FXO Card

A Foreign Exchange Office (FXO) interface connects local calls to a central office or PBX. This is the interface a standard telephone provides. The card is illustrated in Figure 3-24.

Note Ports on this interface card are color-coded pink.

VIC-2FXO is intended for use in North America. In the United States, Canada, and Mexico.

Figure 3-24 2-Port FXO Card Front Panel



Setting Jumpers on the 2-Port FXO Card

The FXO voice interface card includes two jumper headers, W3 and W4, to set loop-start or ground-start mode. One jumper configures each FXO port. The default setting, which should be satisfactory in most installations, is loop start. In this setting, jumpers are placed over positions 2 and 3 of headers W3 and W4.

Most modern central office equipment, such as DMS-100 and 5ESS switches, provides calling party control (CPC) and Ring on Seize on loop-start lines. CPC allows quicker disconnection, and Ring on Seize minimizes glare (collision of inbound and outbound calls on the same interface). If your central office does not provide these features on loop start, you may want to configure the FXO card for ground-start operation instead by moving the jumpers to positions 1 and 2.

For proper operation, both jumpers must be configured identically. In most cases, jumper setting should have little or no effect on operation.

Note This setting does not apply to VIC-2FXO-EU.

Connecting the 2-Port FXO Card

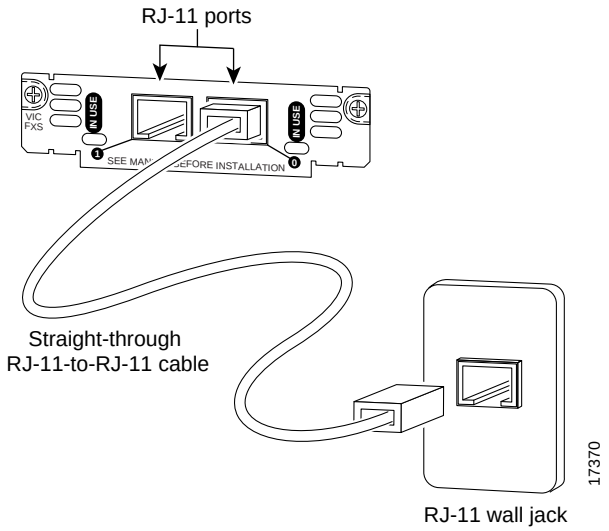
Use a standard RJ-11 modular telephone cable to connect the VIC-2FXO voice interface card to the PSTN or PBX through a telephone wall outlet.

Step 1 Confirm that the router is still turned OFF.

Step 2 Connect one end of the cable to an RJ-11 port on the card. (See Figure 3-25.)

Step 3 Connect the other end to the telephone wall outlet (RJ-11 port).

Figure 3-25 Connecting the 2-Port FXO Card



VIC-2FXO-EU is intended for use in Europe; VIC-2FXO-M3 is intended for use in Australia.

In countries whose PSTNs do not use RJ-11 wall outlets, use a suitable adapter to convert the plug on an RJ-11 modular cable to the type of wall outlet connector used locally. These adapters are not sold by Cisco Systems, but are available from other vendors.

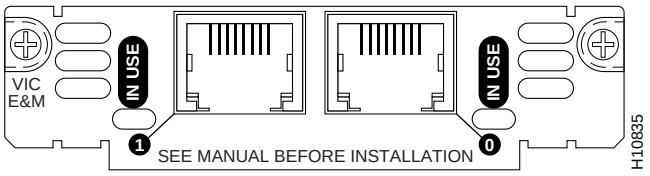
Caution Connect only an FXO interface approved for use in your country to the PSTN. Otherwise, connect the FXO interface only to a PBX. Connections from the PBX to the PSTN are permitted.

2-Port E&M Card

RecEive and transMit (E&M) is a signaling technique for two-wire and four-wire telephone and trunk interfaces. The E&M interface typically connects remote calls from an IP network to a PBX. The card is illustrated in Figure 3-26.

Note Ports on the E&M voice interface card are color-coded brown.

Figure 3-26 2-Port E&M Card Front Panel



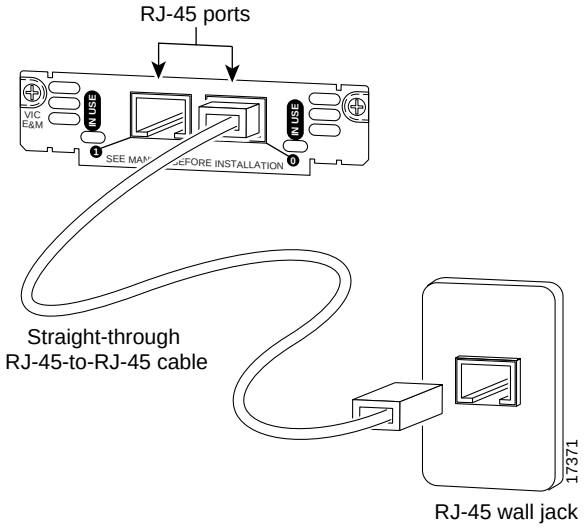
Connecting the 2-Port E&M Card

Step 1 Confirm that the router is still turned OFF.

Step 2 Connect one end of a straight-through RJ-45-to-RJ-45 cable to the card's RJ-45 port. (See Figure 3-27.)

Step 3 Connect the other end to the RJ-45 wall outlet.

Figure 3-27 Connecting the 2-Port E&M Card

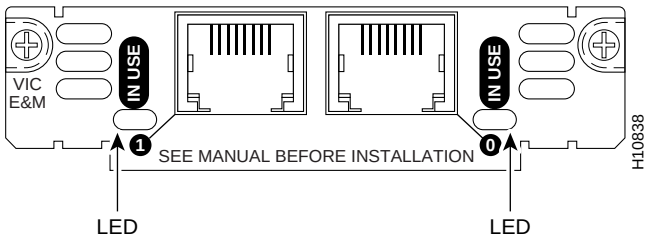


Caution Do not connect an E&M interface directly to the PSTN.

2-Port FXS, FXO, and E&M Card LEDs

Each voice interface card has two IN USE LEDs, one for each channel. Figure 3-28 shows a voice interface card with E&M interface as an example.

Figure 3-28 Voice Interface Card LEDs

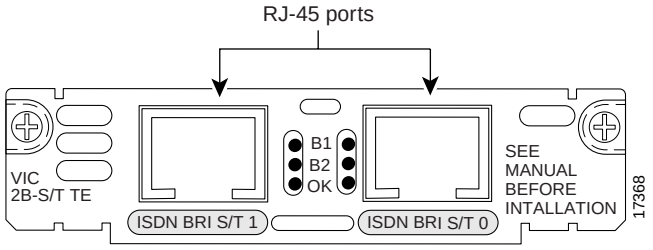


2-Port ISDN BRI Card

The ISDN BRI voice interface card provides a client-side (TE) ISDN S/T physical interface for connection to an NT1 terminating an ISDN telephone network. Each of its two ports can carry two voice calls (one over each ISDN B channel) for a total of four calls per ISDN BRI card.

The card is illustrated in Figure 3-29.

Figure 3-29 2-Port ISDN BRI Card Front Panel



ISDN BRI Card Considerations

To use all four voice channels, you must install the ISDN BRI card in slot 0 of a two-slot voice network module (Cisco part number NM-2V). Slot 1 should remain empty.

Note If slot 0 is unoccupied, the system treats it as a pair of analog voice ports.

If you install any of the following configurations, the Cisco IOS software disables certain ports, as shown in Table 3-6:

- An ISDN BRI voice interface card in a one-slot voice network module (Cisco part number NM-1V)
- Two ISDN BRI voice interface cards in a two-slot voice network module
- One ISDN BRI voice interface card and one analog voice interface card (VIC-2FXS, VIC-2FXO, VIC-2FXO-EU, VIC-2FXO-M3, or VIC-2E/M) in a two-slot voice network module

Table 3-6 Voice Interface Card Configurations

Network Module	Slot	Voice Interface Card	Port	Status
NM-1V	0	VIC-2BRI-S/T-TE	0	Up
			1	Down
NM-2V	0	VIC-2BRI-S/T-TE	0	Up
			1	Up
NM-2V	0	VIC-2BRI-S/T-TE	0	Up
			1	Up
	1	VIC-2BRI-S/T-TE	0	Down
			1	Down
NM-2V	0	VIC-2BRI-S/T-TE	0	Up
			1	Up

Table 3-6 Voice Interface Card Configurations (continued)

Network Module	Slot	Voice Interface Card	Port	Status
	1	Analog voice interface card	0	Down
			1	Down
	0	Analog voice interface card	0	Up
			1	Up
	1	VIC-2BRI-S/T-TE	0	Up
			1	Down

Connecting the 2-Port ISDN BRI Card

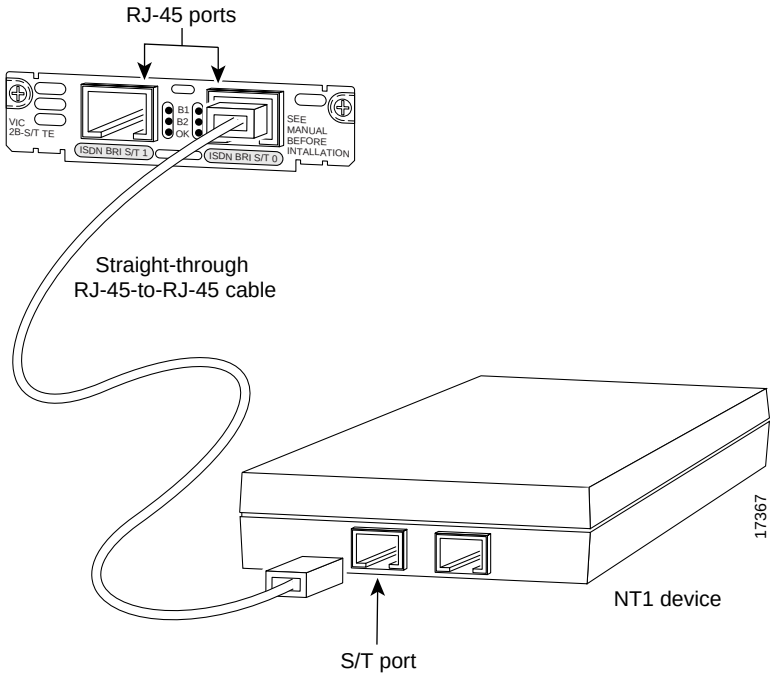
Step 1 Confirm that the router is still turned OFF.

Step 2 Connect one end of a straight-through RJ-45-to-RJ-45 cable to the card's RJ-45 port. (See Figure 3-30.)

Step 3 Connect the other end to the RJ-45 wall outlet.

Caution To prevent damage to the router, be sure to connect the BRI cable to the BRI connector only, and not to any other RJ-45 connector.

Figure 3-30 Connecting the 2-Port ISDN BRI Card



ISDN BRI Card LEDs

ISDN BRI voice interface cards have three LEDs as listed in Table 3-7.

Table 3-7 ISDN BRI Voice Interface Card LEDs

LED	Meaning
B1	Call active on B1 channel
B2	Call active on B2 channel
OK	Interface is connected to an ISDN network

If you have additional cards to install, proceed to the appropriate section(s) in this manual. When you have finished all installations, see the software configuration guide that shipped with your hardware.